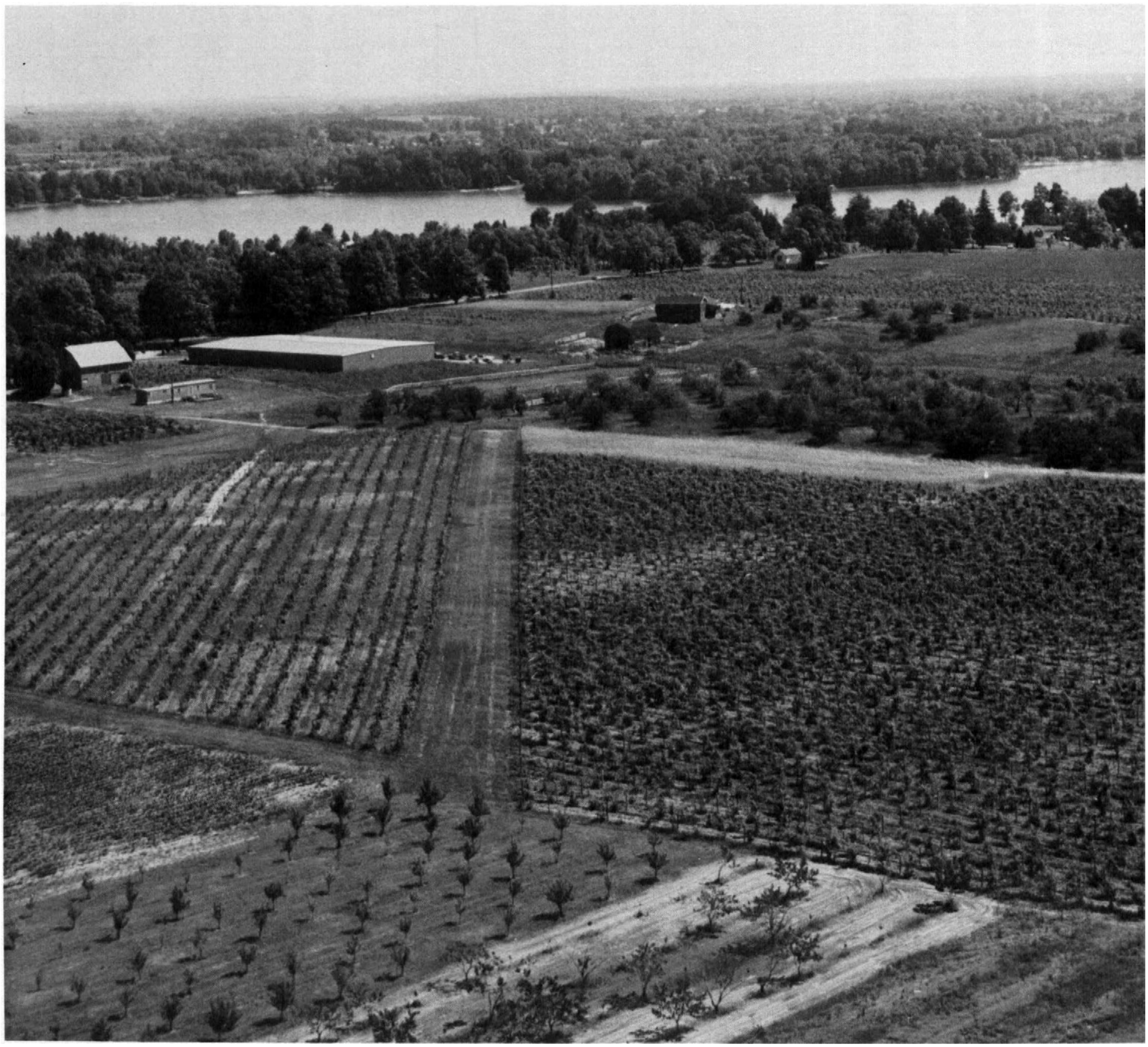
United States Department of Agriculture

Soil Conservation Service

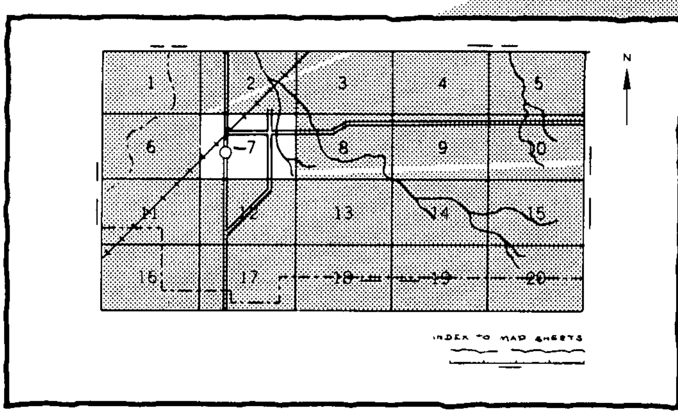
In cooperation with Michigan Agricultural Experiment Station

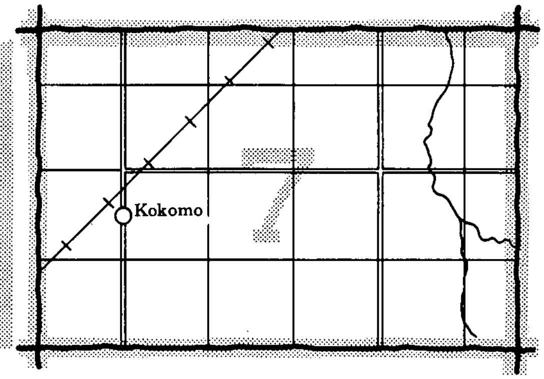
Soil Survey of Allegan County, Michigan



HOW TO USE

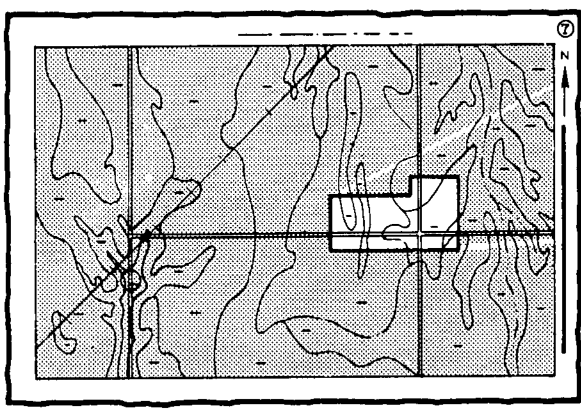
1. Locate your area of interest on the "Index to Map Sheets."

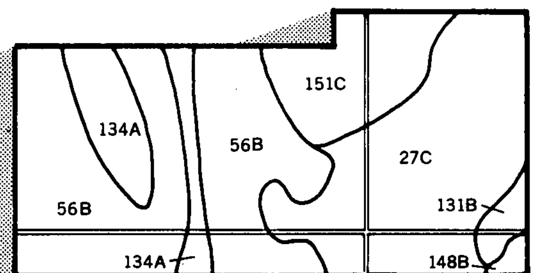




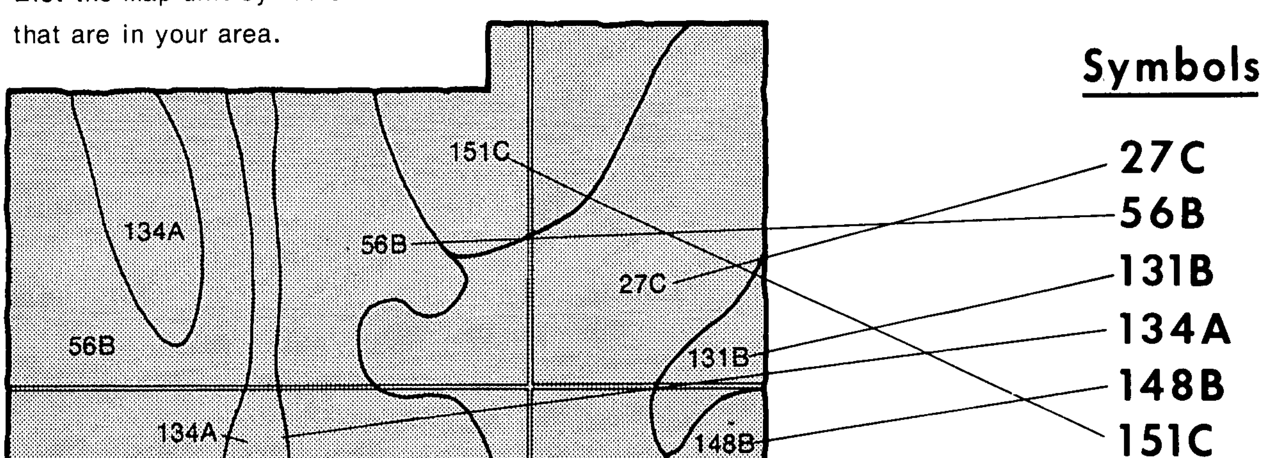
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



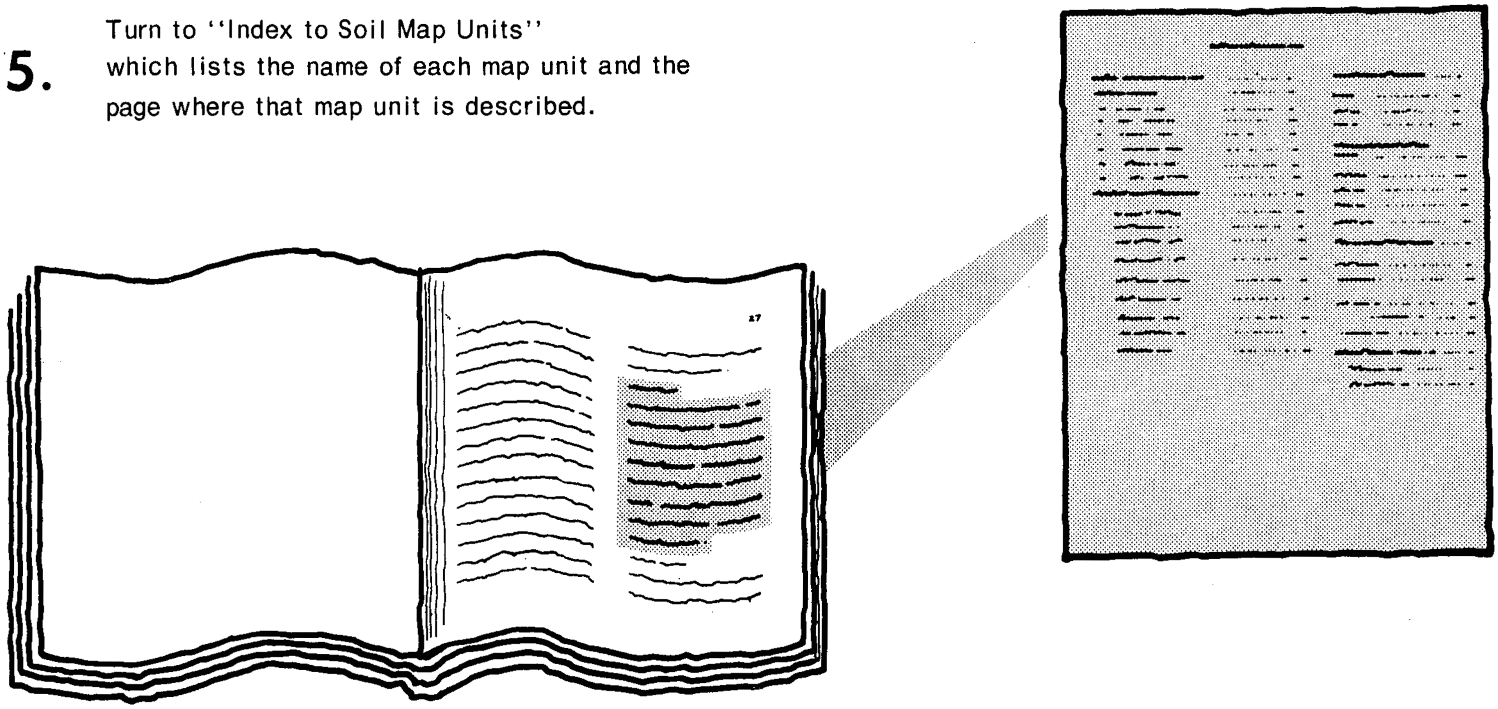


4. List the map unit symbols that are in your area.

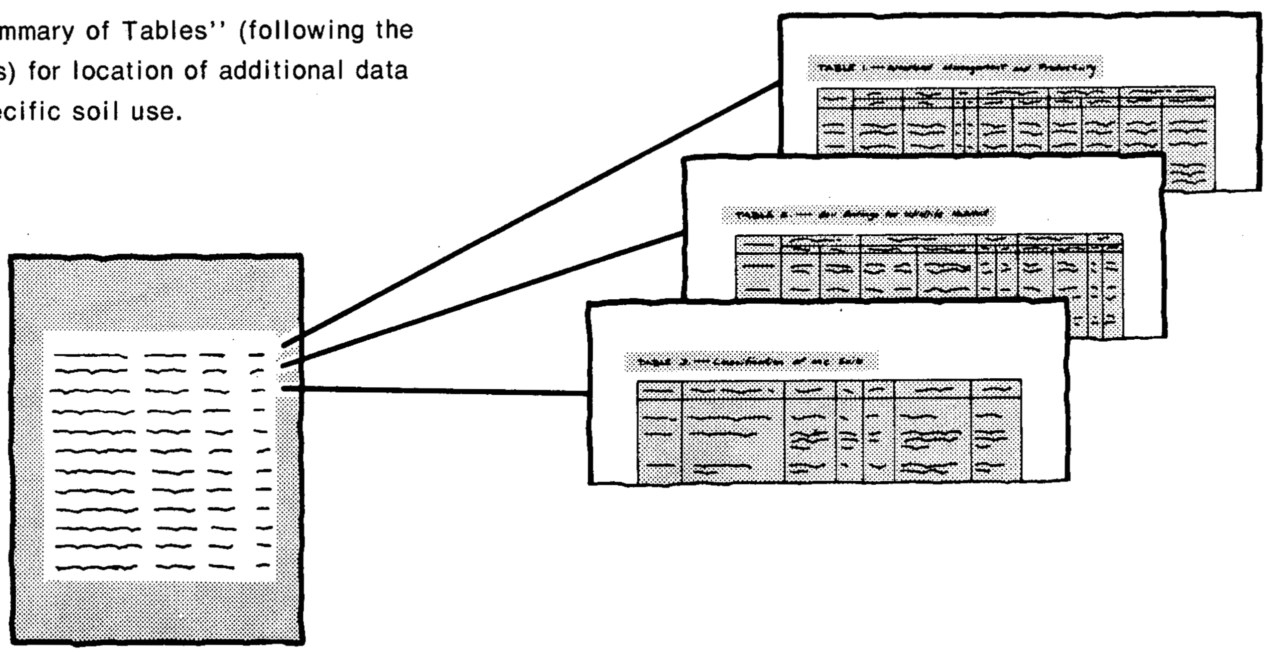


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1983. Soil names and descriptions were approved in 1984. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1983. This survey was made cooperatively by the Soil Conservation Service and the Michigan Agricultural Experiment Station. It is part of the technical assistance furnished to the East Allegan Soil Conservation District and the Alle-Van Soil and Water Conservation District. Financial assistance was made available by the Allegan County Board of Commissioners.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: An area of Oshtemo and Chelsea soils used for orchards. Many orchards in the county are in areas of unique farmland.

Contents

Soil Series

Issued March 1987

Index to Map Units

Summary of Tables

Foreword

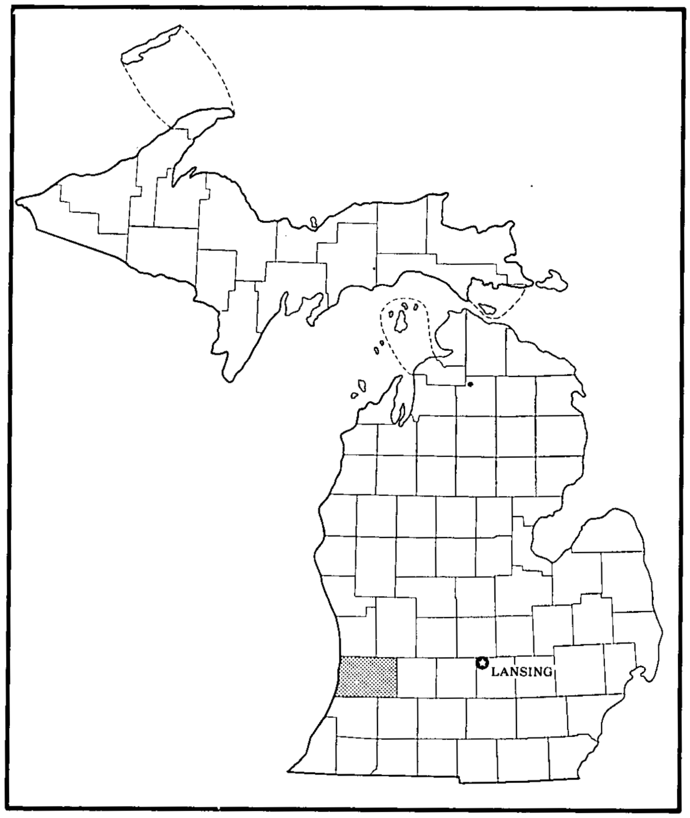
This soil survey contains information that can be used in land-planning programs in Allegan County, Michigan. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Homer R. Hilner
State Conservationist
Soil Conservation Service



Location of Allegan County in Michigan.

Soil Survey of Allegan County, Michigan

By Bruce D. Knapp, Soil Conservation Service

Fieldwork by William C. Anzalone, Bruce D. Knapp, Lyle H. Linsemier, and William E. Perkis, Soil Conservation Service, and Mary I. Dugan and Peter J. Lumbert, Allegan County

United States Department of Agriculture, Soil Conservation Service, in cooperation with the Michigan Agricultural Experiment Station

ALLEGAN COUNTY is in the southwestern part of the Lower Peninsula of Michigan. It borders Lake Michigan. It has an area of 535,680 acres, or about 837 square miles. The county seat is Allegan, in the south-central part of the county. The population of the county in 1981 was 81,318.

About 50 percent of the county is farmland, 28 percent is woodland, and 22 percent is urban and built-up land, wildlife habitat, and parks and other recreation areas. Many wooded areas are second growth woodlots on farms, but a large forest of mainly oak and some scattered pine is in the generally flat areas of droughty sand in the south-central part of the county.

The county has 71 different kinds of soil areas. The soils vary widely in texture, natural drainage, slope, and other characteristics. Well drained soils make up about 48 percent of the county, somewhat poorly drained soils make up 35 percent, and poorly drained and very poorly drained, mineral and organic soils make up 12 percent. Urban land complexes, miscellaneous areas, and water areas make up the rest of the county.

This soil survey updates the survey of Allegan County published in 1901, the first soil survey in Michigan (*4*). The present survey provides additional information and has larger maps, which show the soils in greater detail.

General Nature of the County

Thaddeus Piwowar, district conservationist, Soil Conservation Service, helped prepare this section.

This section gives general information about the county. It describes history and development, climate, farming, industry and transportation facilities, physiography and relief, and lakes and streams.

History and Development

The first known inhabitants of the survey area were the Mound Builders, who are believed to have inhabited the region previous to occupation by other Indians. By the 1600's, the survey area was the domicile or hunting grounds of the Ottawa, Miami, and Potawatomi Indians, who had migrated into the area from the north and southwest.

In 1675, Father Jacques Marquette, of the Society of Jesus, traveled with two or three companions in a small boat along the eastern shore of Lake Michigan, part of which is the western border of the survey area. The first settlers to engage in general agriculture arrived in the area about 1830. For a few years, the only type of farming was subsistence farming. Later, logging and lumbering were gradually replaced by general farming, which was the chief occupation until fruit culture began in part of the county in about 1880.

Initially, most of the area was covered by deciduous and coniferous forest. Most of the trees were harvested by 1900. White pine was the conifer most valued by the loggers, and hard maple, black walnut, and yellow-poplar were the most valued deciduous trees.

Allegan County was set off in 1831 and organized in 1835. The county's name was coined by Henry Schoolcraft, a noted student of the Indians of the area.

Settlement of the county seat, Allegan, was promoted in 1835 by capitalists from the Eastern States who wanted to use the site as a source of water power.

In 1840, one grist mill and one shake mill were established in an area several miles east of Wayland, on one of the branches of the Little Rabbit River. This area was a stopping place for travelers between Kalamazoo and Grand Rapids.

Lumbering increased in extent after the Civil War. The valleys of the Kalamazoo and Rabbit Rivers were lumbered first. Lumber mills were established along the rivers, and the logs were floated by lake boats and shipped to the larger cities along the Great Lakes. The Kalamazoo River was open to boats until after 1900. After the advent of railroads, the first of which were wood burners, the entire county was lumbered. By 1895, most of the big timber in the uplands had been harvested.

The railroads sold their holdings to their workers in tracts of 80 acres. The workers developed certain areas of the county for agricultural uses. Descendants of these workers inhabit various ethnic communities throughout the county.

The advent of the railroads stimulated industry. Early industry was primarily agriculturally based. It included many small creameries and apple-drying enterprises. These industries flourished from the 1870's to about 1920. One of the largest pharmaceutical industries in Michigan began as an apple-drying enterprise in the county.

Manufacturing of automobiles influenced local industry. In 1913, the Cornelian automobile was built in Allegan. No automobiles are currently manufactured in the county, but automotive components and accessories are still manufactured.

In the 1920's large tracts of land in the central part of the county were obtained by the federal government and the resident farmers were resettled to other parts of Michigan. This area was known as the "Allegan Land Utilization" project and, for a short time, was administered by the Soil Conservation Service. It was subsequently deeded to the Michigan Department of Conservation. Much of this land is now part of the Allegan State Game Area.

Agriculture, industry, and tourism are currently the important sources of income in the county.

Climate

Prepared by the Michigan Department of Agriculture, Climatology Division, East Lansing, Michigan.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Allegan in the period 1951 to 1980. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 25.7 degrees F, and the average daily minimum temperature is 17.8 degrees. The lowest recorded temperature, which occurred at Allegan on February 11, 1899, is -35 degrees. In summer the average temperature is 69.6 degrees, and the average daily maximum temperature is 81.6 degrees. The highest recorded temperature, which occurred at Allegan on July 13,1936, is 106 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 35.7 inches. Of this, 19.99 inches, or 56 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 16.4 inches. The heaviest 1-day rainfall during the period of record was 6.23 inches at Allegan on June 26, 1978. Thunderstorms occur on about 38 days each year.

The average seasonal snowfall is 79.7 inches. The greatest recorded snow depth at any one time was 42 inches on January 14, 1910. On the average, 68 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The greatest seasonal snowfall was 142.2 inches, during the winter of 1964-65, and the lowest seasonal snowfall was 15.6 inches, during the winter of 1948-49. The heaviest 1-day snowfall on record was more than 16.0 inches, on January 27, 1967. The greatest monthly snowfall, 57.3 inches, was in January of 1979.

According to data recorded at Grand Rapids, the average relative humidity in midafternoon is about 62 percent. Humidity is higher at night, and the average at dawn is about 82 percent. The sun shines 62 percent of the time possible in summer and 32 percent in winter. The prevailing wind is from the west. Average windspeed is highest, 11.5 miles per hour, in January.

Farming

Originally, the vegetation in the survey area was a heavy growth of hardwoods and pine. After the trees

were cut and the stumps removed, the land was cultivated.

General farming and fruit culture were very profitable during the early years of the county's history. They accounted for the major part of the local income. As the land was cleared, the extent of farming increased for many years. Many of the earliest farm sites are now abandoned, partly because of the poor suitability of the soils for farming and partly because of the depleted productivity resulting from cultivation year after year, erosion, leaching, and loss of organic matter.

From the 1830's to the 1930's, the number of farms and the acreage of farmland increased rapidly. They decreased from the 1930's to the 1960's. From the 1960's to the present, the number of farms has continued to decrease, but the average acreage of cultivated land per farm has increased. In 1954, the county had about 4,255 farms, which made up a total of 365,059 acres and had an average size of 86 acres. In 1974, the county had about 2,175 farms, which made up a total of 265,134 acres and had an average size of 122 acres.

In 1941, the Allegan Soil Conservation District (now the Alle-Van Soil and Water Conservation District) was organized. In 1945, the East Allegan Soil Conservation District was organized. These districts were formed to assist landowners in controlling erosion, maintaining or improving productivity, improving water quality, and preventing pollution.

Dairy farming and raising hogs, poultry, and beef cattle are the main agricultural enterprises in the county (*6*). Cash-grain farming is also important and is becoming more extensive. In 1981, about 103,000 acres was planted to corn for grain, 9,190 acres to corn for silage, 10,100 acres to wheat, 4,000 acres to soybeans, 6,300 acres to oats, and 1,300 acres to potatoes (*6*).

The county is ranked among the top 10 counties in the state in the production of horticulture crops, including apples, tart cherries, sweet cherries, grapes, and blueberries. Peaches, apricots, pears, nectarines, plums, strawberries, and raspberries also are grown. Among the vegetable crops grown commercially are onions, asparagus, cauliflower, cabbage, brussels sprouts, peppers, celery, radishes, and carrots.

Because of the suitability of many soils for a diversity of crops, the favorable climatic conditions, and favorable markets, farming will continue to be a major part of the local economy.

Industry and Transportation Facilities

Industry, manufacturing, and retail trade are important enterprises in Allegan County. About 175 industrial and manufacturing firms are established in the county. Many of them employ 50 persons or less, but a number of the larger establishments employ 500 to 800.

The centers of industry and manufacturing are Allegan, Fennville, Holland, Ostego, and Plainwell. Many of the small towns and villages have two or three manufacturing firms within their boundaries. Some industrial and manufacturing firms are located in the rural areas. Heating equipment, motor vehicle parts and accessories, concrete, tools and dies, processed food, printed materials, metal products, electric controls, wood products, pharmaceuticals, valves and fittings, plastic products, electrical machinery, computer equipment, meat, milk and other dairy products, office furniture, paper, boats, games and toys, wine, and mushrooms are among the items produced.

The county has a number of oil wells. Some areas have a number of major high-pressure gas pipelines. A major natural gas storage field is under most of Overisel and Salem Townships.

Two north-south railroads, one on the west side of the county and the other on the east side, transport freight. They provide no passenger service.

Interstate Highway I-196, along the west side of the county, serves as a connector between Holland and Benton Harbor, Chicago, and Grand Rapids. U.S. Highway 131, a limited-access highway along the east side of the county, serves as a connector between Grand Rapids and Kalamazoo. State Highways M-40, M-89, and M-118 link most of the towns and villages in the county to the interstate and U.S highways and to all points in the state. Four intercounty routes, A-2, A-37, A-42, and A-45, link points in Allegan County with adjoining counties. An excellent system of county roads also serves the county.

Saugatuck and Douglas have harbor facilities off Lake Michigan. These facilities are used for commercial and recreational purposes. Airports are located at Allegan, at Holland, near Otsego and Plainwell, and at Wayland. Some of the airports provide charter passenger service, freight service, or both.

Physiography and Relief

The bedrock in Allegan County consists of Mississippian Sandstone and Shale, which are part of the Michigan Basin (*3*). The upper bedrock layers in the northeastern part of the county are sandstone of the Marshall Formation. Those in the rest of the county are shale of the Coldwater Formation.

Overlying these bedrock formations throughout the county is a mass of glacial drift about 50 to 400 feet thick. This drift was deposited during the Wisconsin Glaciation. The present surface features generally are the result of this glacial deposition, which occurred when the glacial ice receded about 10,000 years ago.

Four major physiographic regions are recognized in Allegan County. The first consists of two moraines oriented north to south. These moraines are the Lake Border moraine, which is adjacent to Lake Michigan, and

the Valparaiso moraine, which extends roughly through the center of the county. The second physiographic region consists of sandy lakebed deposits between the two moraines. The sandy material was probably deposited when water was impounded between the Valparaiso moraine and the glacial ice as the Lake Border moraine was being deposited. The third physiographic region consists of till plains to the east of the Valparaiso moraine, in Trowbridge, Allegan, Watson, Hopkins, and Dorr Townships. The final physiographic region is a large outwash plain dominating the eastern row of townships.

Variations in elevation are not significant in the county. The elevation of Lake Michigan is about 580 feet above sea level, and the highest point in the county, in southeastern Gun Plain Township, is slightly more than 950 feet. The greatest local variations in relief are almost exclusively between the uplands and the flood plains along the Kalamazoo River. They rarely exceed 150 feet.

Lakes and Streams

Allegan County has approximately 25 miles of shoreline along Lake Michigan. It has about 350 ponds and 97 inland lakes and reservoirs (*9*). These water bodies vary greatly in size and shape. Many are less than 3 acres, 20 are 100 acres or more, and a few are more than 250 acres. The larger lakes tend to be in the southern and eastern parts of the county. Among the larger lakes are Lake Allegan Reservoir, in Valley Township; Hutchins Lake, in Saugatuck Township; Green Lake, in Leighton Township; and Miner Lake, in Allegan Township.

The central part of the county is drained by the Kalamazoo River (fig. 1), which flows from the southeast to the northwest and empties into Lake Michigan near Douglas and Saugatuck. The southwestern part of the county is drained by the North and Middle Forks of the Black River, which flow southward into Van Buren County. The northern part of the county is drained by the Rabbit River, which flows in a westerly direction and empties into the Kalamazoo River in Manlius Township. The northwestern part of the county is drained by the North and South Branches of the Macatawa River, which flow northeasterly into Ottawa County.

Bear Creek flows easterly through Monterey and Heath Townships. Swan Creek flows northerly through Cheshire and Valley Townships. Dumont Creek flows southerly through Monterey and Allegan Townships. The Gun River flows southwesterly through Martin, Gun Plain, and Otsego Townships. Pine-Baseline Creek flows easterly through Trowbridge and Otsego Township. All of the creeks are tributaries of the Kalamazoo River. Green Lake Stream flows northerly in Leighton Township and empties into Green Lake.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

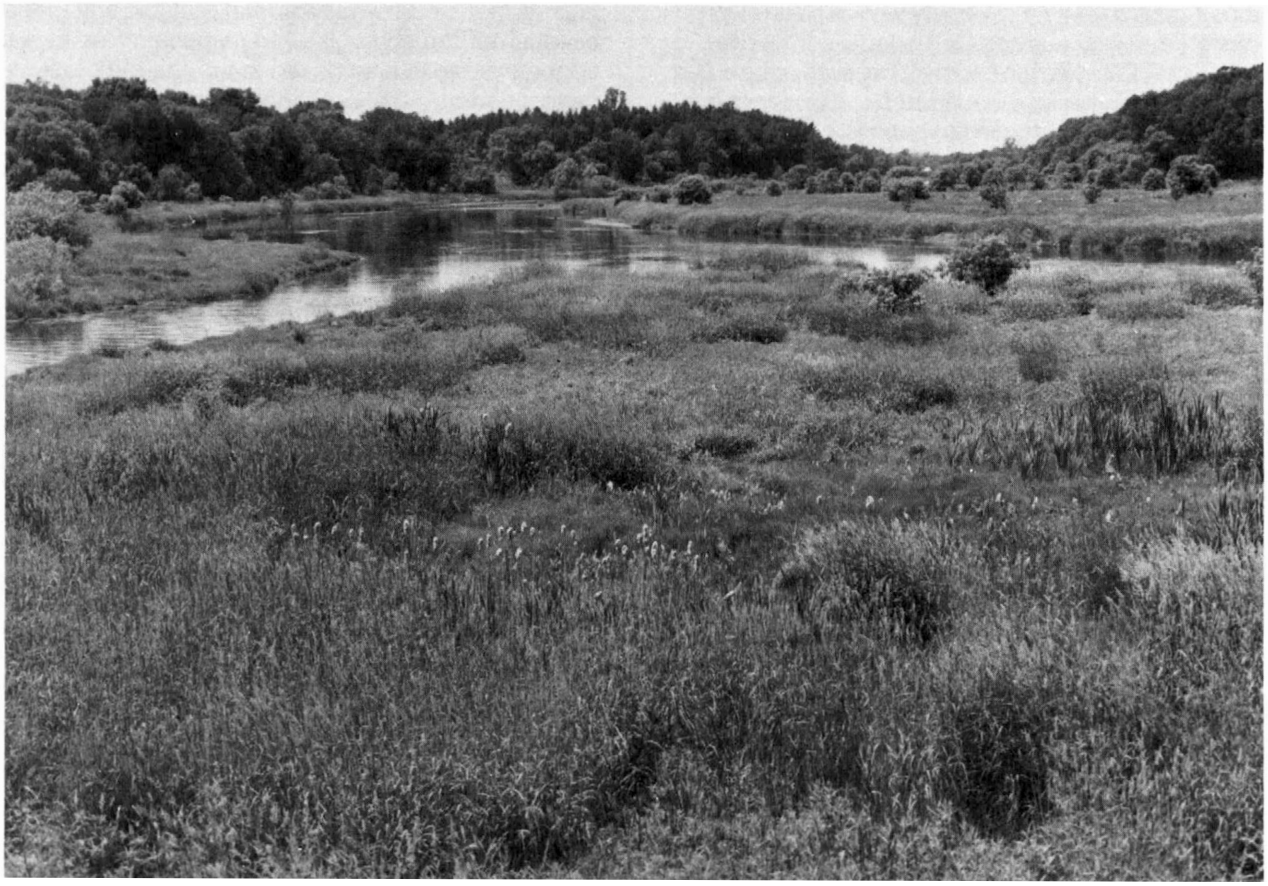


Figure 1.—An area of Sloan silt loam where Pine Creek joins the Kalamazoo River.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the

soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Some of the boundaries on the general soil map of Allegan County do not match those on the general soil maps of adjacent counties, and some of the soil names and descriptions do not fully agree. Differences are the result of modifications or refinements in soil series concepts or variations in the intensity of mapping or in the extent of the soils within the survey areas.

Soil Descriptions

1. Glendora-Adrian-Granby Association

Nearly level, poorly drained and very poorly drained soils formed in sandy and organic material; on flood plains, outwash plains, lake plains, and till plains

Glendora soils are on flood plains. Adrian soils are in natural drainageways and depressional areas. Granby soils are in low areas in and along drainageways. Slope ranges from 0 to 2 percent.

This association makes up about 6 percent of the county. It is about 30 percent Glendora and similar soils, 25 percent Adrian and similar soils, 25 percent Granby and similar soils, and 20 percent soils of minor extent.

Glendora soils are poorly drained. Typically, the surface layer is black loamy sand about 10 inches thick. The substratum to a depth of about 60 inches is multicolored fine sand and sand.

Adrian soils are very poorly drained. Typically, the surface layer is black muck about 13 inches thick. The next part is also black muck. It is about 21 inches thick. The substratum to a depth of about 60 inches is grayish brown sand.

Granby soils are poorly drained. Typically, the surface layer is very dark gray loamy sand about 11 inches thick. The subsoil is light brownish gray, mottled sand about 15 inches thick. The substratum to a depth of about 60 inches is brown, mottled sand.

Some of the minor soils in this association are the very poorly drained Martisco soils and Aquents and Histosols. Martisco soils are shallow over marl. Aquents and Histosols are in depressions and drainageways that are ponded most of the time.

Most areas of this association are used as cropland. Large areas are used as woodland or are left idle. The major soils are poorly suited to cropland and are moderately well suited to woodland. Wetness and flooding are the major concerns in managing cropland. In some areas drainage outlets are unavailable. If the soils are drained, soil blowing and a low available water capacity are the major management concerns. The equipment limitation, seedling mortality, and the windthrow hazard are the major concerns in managing woodland.

The major soils are generally unsuited to buildings and septic tank absorption fields because of wetness and ponding or flooding.

2. Capac-Rimer-Pipestone Association

Nearly level and undulating, somewhat poorly drained soils formed in loamy, sandy, and silty material; on moraines, till plains, lake plains, and outwash plains

Areas of the major soils in this association are intermingled on broad plains, low ridges, and knolls. Slope ranges from 0 to 6 percent.

This association makes up about 24 percent of the county. It is about 40 percent Capac and similar soils, 10 percent Rimer and similar soils, 10 percent Pipestone and similar soils, and 40 percent soils of minor extent.

Typically, the surface layer of the Capac soils is dark grayish brown loam about 9 inches thick. The next 4 inches is a mixture of yellowish brown, mottled clay loam and light brownish gray sandy loam. The subsoil is yellowish brown, mottled clay loam about 14 inches thick. The substratum to a depth of about 60 inches is brown and yellowish brown, mottled clay loam and loam.

Typically, the surface layer of the Rimer soils is dark brown loamy sand about 11 inches thick. The subsoil is about 25 inches thick. It is mottled. The upper part is yellowish brown loamy sand, the next part is dark yellowish brown and dark brown sandy loam, and the lower part is brown silty clay loam. The substratum to a depth of about 60 inches is brown, mottled silty clay loam.

Typically, the surface layer of the Pipestone soils is very dark grayish brown sand about 9 inches thick. The subsurface layer is pinkish gray sand about 7 inches thick. The subsoil is about 8 inches thick. It is mottled. The upper part is dark reddish brown, weakly cemented sand, and the lower part is strong brown sand. The upper part of the substratum is yellowish brown sand. The lower part to a depth of about 60 inches is grayish brown loamy sand.

Some of the minor soils in this association are Brookston, Oakville, and Marlette soils. Brookston soils are very poorly drained and are in depressions and along drainageways. Marlette and Oakville soils are moderately well drained and are on ridgetops and side slopes.

Most areas of this association are used as cropland. Some are used as woodland or are left idle. The major soils are well suited to cropland and woodland. Excess water and water erosion are the major concerns in managing cropland. If the soils are drained, drought is a hazard on the sandy soils. Soil blowing also is a hazard on the sandy soils. The equipment limitation is the major concern in managing woodland.

The major soils are poorly suited or generally unsuited to septic tank absorption fields and buildings. Wetness and restricted permeability are the major management concerns. A poor filtering capacity is a concern if the Pipestone soils are used as sites for septic tank absorption fields.

3. Oshtemo-Chelsea-Ockley Association

Rolling to very hilly, well drained and somewhat excessively drained soils formed in loamy and sandy material; on moraines, outwash plains, terraces, and valley trains

Oshtemo soils commonly are on hill crests and ridgetops. They also are on knolls and side slopes. Chelsea and Ockley soils are on knolls, hills, ridges, and side slopes. Slope ranges from 12 to 35 percent.

This association makes up about 2 percent of the county. It is about 40 percent Oshtemo and similar soils, 10 percent Chelsea and similar soils, 10 percent Ockley and similar soils, and 40 percent soils of minor extent.

Oshtemo soils are well drained. Typically, the surface layer is dark brown loamy sand about 10 inches thick. The subsoil is about 25 inches thick. The upper part is dark yellowish brown sandy loam, and the lower part is strong brown sandy clay loam. Below this to a depth of about 60 inches is strong brown sand that has bands of loamy sand.

Chelsea soils are somewhat excessively drained. Typically, they are covered by a very dark brown leaf litter about 1 inch thick. The surface layer is very dark brown loamy fine sand about 4 inches thick. The subsurface layer is dark yellowish brown fine sand about 25 inches thick. Below this to a depth of about 60 inches is brownish yellow fine sand that has thin bands of strong brown loamy fine sand.

Ockley soils are well drained. Typically, the surface layer is dark grayish brown loam about 10 inches thick. The subsoil is about 31 inches thick. It is dark brown. The upper part is sandy clay loam, the next part is sandy loam, and the lower part is sandy clay loam. The substratum to a depth of about 60 inches is dark brown gravelly sand.

Some of the minor soils in this association are Brady, Adrian, Houghton, and Glendora soils. The somewhat poorly drained Brady soils are on low plains. The very poorly drained Adrian and Houghton and poorly drained Glendora soils are in depressions and along drainageways.

Most areas of this association are left idle or are used as woodland. Some small areas are used as cropland. The major soils are poorly suited or generally unsuited to cropland and are well suited to woodland. Slope, droughtiness, water erosion, and soil blowing are the major concerns in managing cropland. Water erosion, the equipment limitation, and the seedling mortality rate are the main concerns in managing woodland.

The major soils are poorly suited or generally unsuited to septic tank absorption fields and buildings. The slope and a poor filtering capacity are the major management concerns.

4. Chelsea-Ockley-Oshtemo Association

Nearly level to gently rolling, somewhat excessively drained and well drained soils formed in sandy and loamy material; on moraines, outwash plains, terraces, and valley trains

Chelsea soils commonly are on the tops of knolls and low ridges. They also are on plains. Ockley and Oshtemo soils are on plains, knolls, ridges, and side slopes. Slope ranges from 0 to 12 percent.

This association makes up about 14 percent of the county. It is about 25 percent Chelsea and similar soils, 20 percent Ockley and similar soils, 20 percent Oshtemo soils, and 35 percent soils of minor extent.

Chelsea soils are somewhat excessively drained. Typically, they are covered by a very dark brown leaf litter about 1 inch thick. The surface layer is very dark brown loamy fine sand about 4 inches thick. The subsurface layer is dark yellowish brown fine sand about 25 inches thick. Below this to a depth of about 60 inches is brownish yellow fine sand that has thin bands of strong brown loamy fine sand.

Ockley soils are well drained. Typically, the surface layer is dark grayish brown loam about 10 inches thick. The subsoil is about 31 inches thick. It is dark brown. The upper part is sandy clay loam, the next part is sandy loam, and the lower part is sandy clay loam. The substratum to a depth of about 60 inches is dark brown gravelly sand.

Oshtemo soils are well drained. Typically, the surface layer is dark brown loamy sand about 10 inches thick. The subsoil is about 25 inches thick. The upper part is dark yellowish brown sandy loam, and the lower part is strong brown sandy clay loam. Below this to a depth of about 60 inches is strong brown sand that has bands of loamy sand.

Some of the minor soils in this association are Brady, Adrian, Houghton, and Glendora soils. The somewhat poorly drained Brady soils are on low plains. The very poorly drained Adrian and Houghton and poorly drained Glendora soils are in depressions and along drainageways.

Most areas of this association are used as cropland. Some are left idle or are used as woodland. The major soils range from well suited to poorly suited to cropland. The nearly level and undulating soils are well suited to moderately well suited. Water erosion is a hazard on the loamy soils. Water erosion, soil blowing, and drought are hazards on the sandy soils. All of the major soils are well suited to woodland. Seedling mortality is a concern in managing wooded areas of the sandy soils.

The major soils are well suited or moderately well suited to septic tank absorption fields and buildings. The slope is a management concern on the gently rolling soils, and a poor filtering capacity is a concern on the sandy soils.

5. Morocco-Newton-Oakville Association

Nearly level and undulating, somewhat poorly drained, very poorly drained, well drained, and moderately well drained soils formed in sandy material; on outwash plains, lake plains, and beach ridges.

Morocco soils are on broad, smooth or slightly convex plains, on low ridges, and on side slopes. Newton soils are on low flats and in depressions and drainageways. Oakville soils are on uplands, beach ridges, knolls, and plains. Slope ranges from 0 to 6 percent.

This association makes up about 10 percent of the county. It is about 30 percent Morocco and similar soils, 20 percent Newton and similar soils, 20 percent Oakville and similar soils, and 30 percent soils of minor extent.

Morocco soils are nearly level and undulating and are somewhat poorly drained. Typically, the surface soil is black and reddish gray fine sand about 2 inches thick. The subsoil is fine sand about 22 inches thick. It is mottled. The upper part is dark brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is pale brown and light yellowish brown, mottled fine sand.

Newton soils are nearly level and very poorly drained. Typically, the surface layer is black mucky fine sand about 11 inches thick. The substratum to a depth of about 60 inches is dark grayish brown and pale brown fine sand.

Oakville soils are nearly level and undulating and are well drained or moderately well drained. Typically, the surface layer is dark brown fine sand about 9 inches thick. The subsoil is yellowish brown fine sand about 15 inches thick. The substratum to a depth of about 60 inches is brownish yellow fine sand.

The minor soils in this association are the poorly drained Glendora and very poorly drained Houghton soils in depressions and drainageways. Houghton soils are organic.

Most areas of this association are used as woodland. Some are used as cropland or are left idle. The major soils are poorly suited or generally unsuited to cropland. Drought and soil blowing are hazards. Also, wetness is a concern in managing the Morocco and Newton soils. Specialty crops, such as blueberries, are grown in areas of the Morocco soils. All the major soils are well suited or moderately well suited to woodland. Seedling mortality and the equipment limitation are concerns in managing woodland.

The major soils range from well suited to generally unsuited to buildings and septic tank absorption fields. The wetness of the Morocco and Newton soils and a poor filtering capacity in all of the major soils are the main management concerns.

6. Marlette-Capac-Metea Association

Nearly level to very hilly, moderately well drained, somewhat poorly drained, and well drained soils formed in loamy and sandy material; on moraines and till plains

Marlette and Metea soils are on knolls, ridges, hills, and rolling uplands. Capac soils are on low knolls, on low side slopes, on broad, nearly level and undulating plains, and in drainageways. Slope ranges from 0 to 35 percent.

This association makes up about 19 percent of the county. It is about 40 percent Marlette and similar soils, 15 percent Capac and similar soils, 15 percent Metea soils, and 30 percent soils of minor extent (fig. 2).

Marlette soils are nearly level to very hilly and are moderately well drained or well drained. Typically, the surface layer is brown loam about 10 inches thick. The next 14 inches is mixed brown clay loam and pale brown loam. The subsoil is brown clay loam about 14 inches thick. The substratum to a depth of about 60 inches is brown loam and dark brown clay loam.

Capac soils are nearly level and undulating and are somewhat poorly drained. Typically, the surface layer is dark grayish brown loam about 9 inches thick. The next 4 inches is mixed yellowish brown clay loam and light brownish gray sandy loam. The subsoil is yellowish

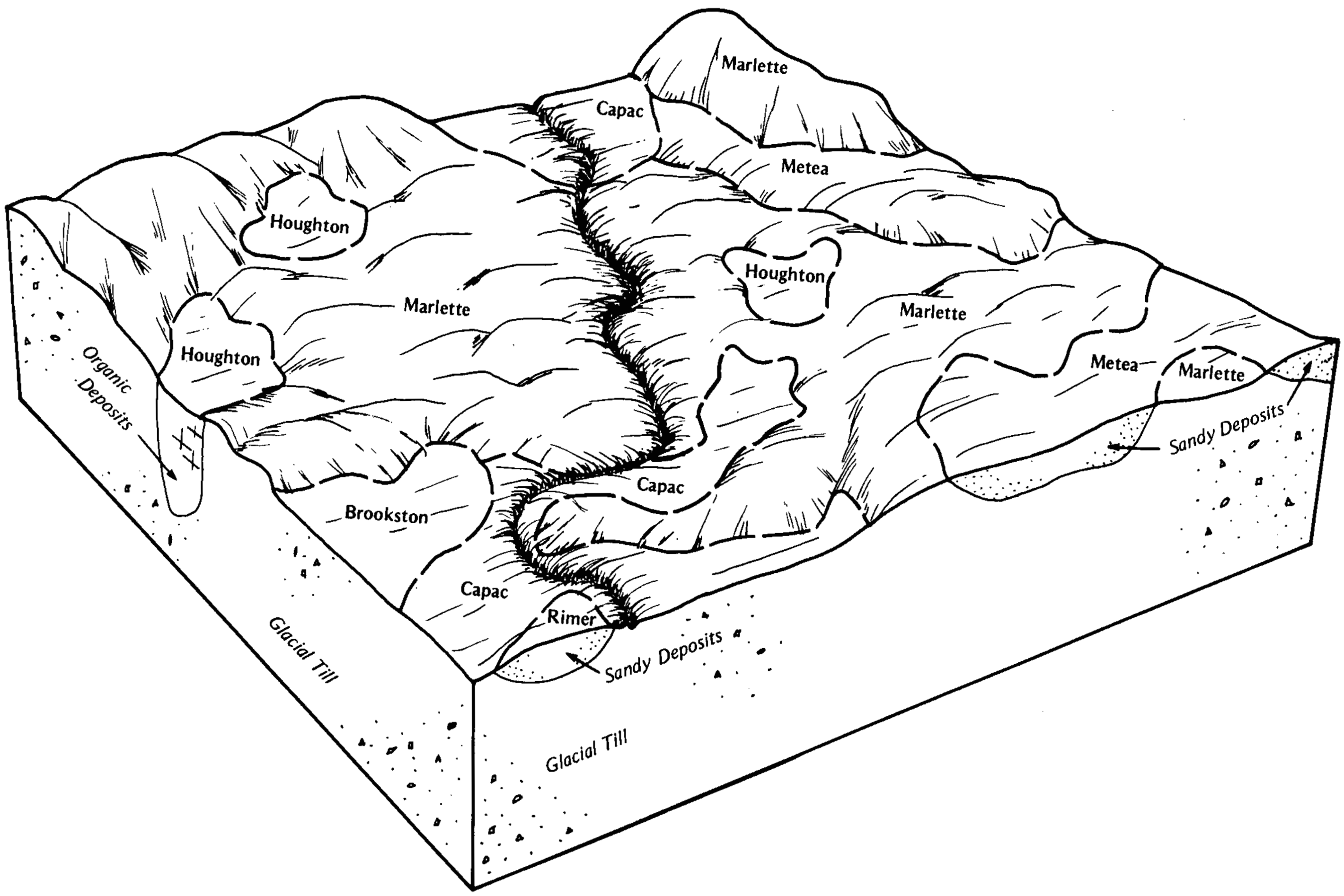


Figure 2.—Pattern of soils and underlying material in the Marlette-Capac-Metea association

brown, mottled clay loam about 14 inches thick. The substratum to a depth of about 60 inches is brown and yellowish brown, mottled clay loam and loam.

Metea soils are nearly level to gently rolling and are well drained. Typically, the surface layer is very dark grayish brown loamy fine sand about 12 inches thick. The subsoil is about 29 inches thick. The upper part is yellowish brown loamy fine sand and sandy loam, and the lower part is yellowish brown clay loam. The substratum to a depth of about 60 inches is brown clay loam.

Some of the minor soils in this association are Rimer, Brady, Brookston, and Houghton soils. The sandy Rimer and Brady soils are somewhat poorly drained and are on low knolls and side slopes. Brookston and Houghton soils are very poorly drained and are in depressions and drainageways.

Most areas of this association are used as cropland. Some are used as woodland or are left idle. The nearly level to gently rolling soils are well suited or fairly well suited to cropland. The soils that have a slope of more than 12 percent are poorly suited or unsuited. Water erosion is a hazard. The wetness of the Capac soils, tilth in the Capac and Marlette soils, and drought and soil blowing on the Metea soils are additional management concerns. All of the major soils are well suited to woodland. Erosion is a concern in managing wooded areas of the more sloping soils. The equipment limitation and the windthrow hazard on the Capac soils and seedling mortality on the Metea soils are additional management concerns.

The major soils range from moderately well suited to generally unsuited to buildings and septic tank absorption fields. The slope is a management concern on the gently rolling to very hilly soils. The wetness and restricted permeability in the Capac soils are additional concerns.

7. Sebewa-Colwood-Brady Association

Nearly level, poorly drained and somewhat poorly drained soils formed in loamy, sandy, and silty material; on outwash plains, lake plains, valley trains, and terraces

Sebewa and Colwood soils are on broad, nearly level plains, in depressions, and in drainageways. Brady soils are in the slightly higher areas and on low rises. Slope ranges from 0 to 3 percent.

This association makes up about 3 percent of the county. It is about 30 percent Sebewa soils, 30 percent Colwood soils, 30 percent Brady and similar soils, and 10 percent soils of minor extent.

Sebewa soils are poorly drained. Typically, the surface layer is black loam about 10 inches thick. The subsoil is about 15 inches thick. It is mottled. The upper part is dark gray sandy loam, and the lower part is grayish brown clay loam. The upper part of the substratum is brown sand. The lower part to a depth of about 60 inches is yellowish brown sand that has bands of clay loam.

Colwood soils are poorly drained. Typically, the surface layer is very dark gray silt loam about 12 inches thick. The subsoil is gray, mottled silt loam about 20 inches thick. The substratum to a depth of about 60 inches is gray, stratified silt loam, fine sandy loam, fine sand, and loamy sand.

Brady soils are somewhat poorly drained. Typically, the surface layer is dark brown sandy loam about 9 inches thick. The subsurface layer is brown sandy loam about 3 inches thick. The subsoil is about 43 inches thick. It is mottled. The upper part is strong brown loam, the next part is yellowish brown loamy sand and strong brown sandy clay loam, and the lower part is dark yellowish brown loamy sand. The substratum to a depth of about 60 inches is grayish brown coarse sand.

Some of the minor soils in this association are the sandy Granby and Thetford soils. Granby soils are poorly drained and are in depressions and drainageways. Thetford soils are somewhat poorly drained and are on plains.

Most areas of this association are used as cropland. Some are used as woodland. The major soils are well suited to cropland and are well suited or moderately well suited to woodland. Excess water and tilth are the major concerns in managing cropland. In some areas drainage outlets are unavailable. Soil blowing is a hazard on Brady soils. The equipment limitation, seedling mortality, and the windthrow hazard are the major concerns in managing woodland.

The major soils are generally unsuited or poorly suited to buildings and septic tank absorption fields because of wetness and restricted permeability.

8. Oakville Association

Nearly level to steep, moderately well drained and well drained soils formed in sandy material; on outwash plains, lake plains, dunes, moraines, and beach ridges

Oakville soils are on broad, sandy plains and stabilized sand dunes and ridges. Slope ranges from 0 to 45 percent.

This association makes up 22 percent of the county. It is about 75 percent Oakville and similar soils and 25 percent soils of minor extent (fig. 3).

Typically, the surface layer of the Oakville soils is dark brown fine sand about 9 inches thick. The subsoil is yellowish brown fine sand about 15 inches thick. The substratum to a depth of about 60 inches is brownish yellow fine sand.

Some of the minor soils in this association are Morocco, Pipestone, Newton, and Glendora soils. The somewhat poorly drained Morocco and Pipestone soils are on low plains. The very poorly drained Newton soils and the poorly drained Glendora soils are in depressions and along drainageways.

Most areas of this association are used as woodland. Some are used as cropland. Depending on the slope, the Oakville soils range from moderately well suited to generally unsuited to cropland. They are well suited to woodland. Drought, soil blowing, and water erosion are concerns in managing cropland. Seedling mortality and the equipment limitation are concerns in managing woodland. Also, the slope is a concern in the rolling to steep areas.

Depending on the slope, the major soils range from well suited to generally unsuited to buildings and septic tank absorption fields. A poor filtering capacity and the slope are the major management concerns.

Broad Land Use Considerations

The general soil map can help those who plan residential development, farming, and recreation and other uses on a county-wide scale. Large areas of soils in the county have severe limitations if they are used for residential and urban development. The seasonal high water table in most areas of the Glendora-Adrian-Granby, Capac-Rimer-Pipestone, Morocco-Newton-Oakville, and Sebewa-Colwood-Brady associations is a severe limitation on building sites. The slope of the rolling to steep areas in the Oshtemo-Chelsea-Ockley, Marlette-Capac-Metea, and Oakville associations also is a severe limitation on building sites.

Many of the soils in the county are suited to residential development. These include the less sloping soils in the Chelsea-Ockley-Oshtemo association and the well drained soils in the Marlette-Capac-Metea association. Most of these soils are considered prime farmland. This fact should not be overlooked when broad land uses are considered.

The somewhat excessively drained, well drained, and moderately well drained, gently sloping soils in the Chelsea-Ockley-Oshtemo and Marlette-Capac-Metea associations are in areas near Lake Michigan where air

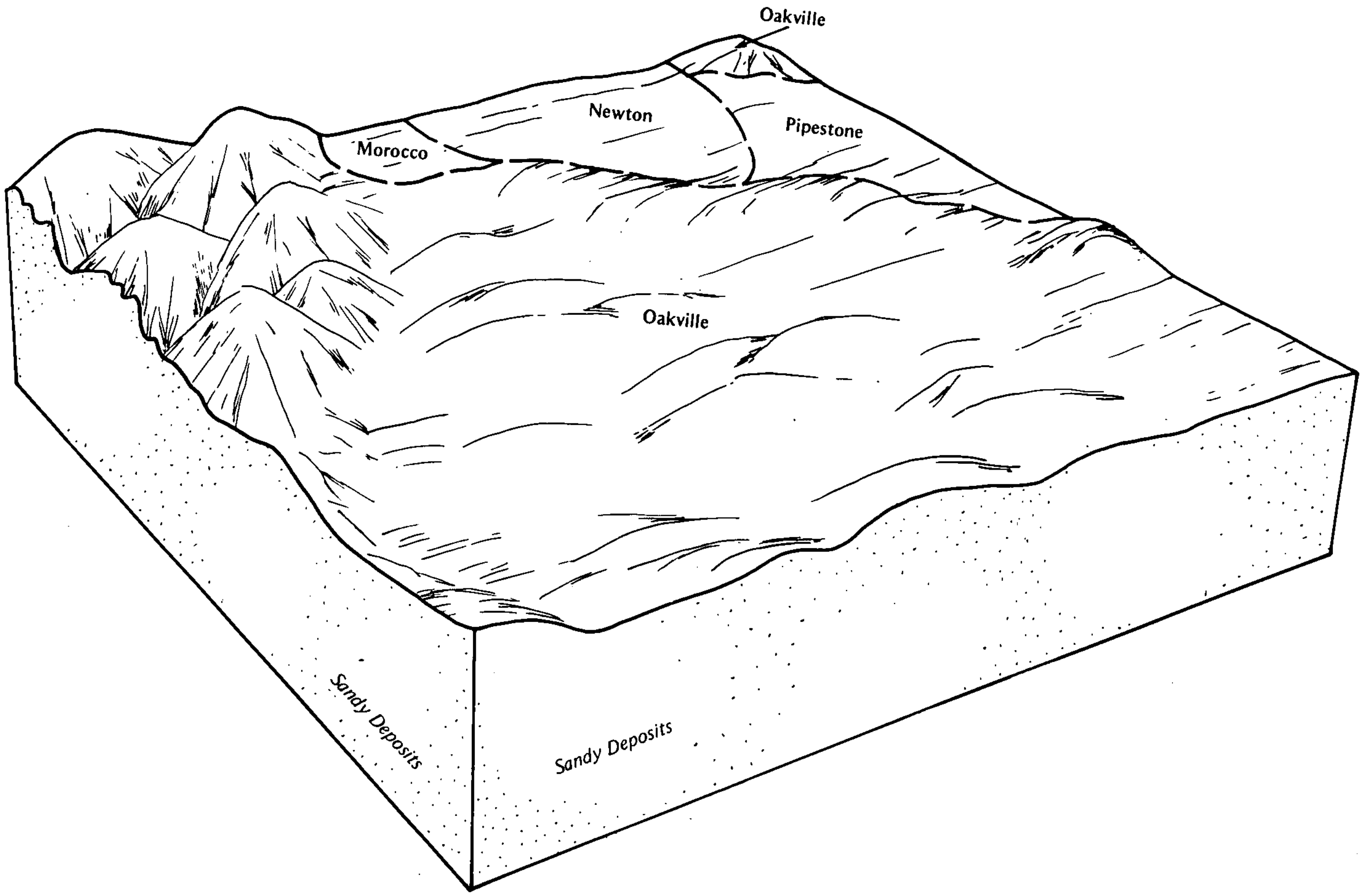


Figure 3.—Pattern of soils and underlying material in the Oakville association.

drainage is good. They are uniquely suited to tree fruits, such as apples, cherries, and peaches. The somewhat poorly drained and very poorly drained soils in the Morocco-Newton-Oakville association are well suited to blueberries. Large areas of the poorly and very poorly drained soils in the Glendora-Adrian-Granby association that are protected from flooding are suited to specialty crops, such as onions, celery, and carrots. The Marlette, Capac, and Ockley soils in the Capac-Rimer-Pipestone, Chelsea-Ockley-Oshtemo, and Marlette-Capac-Metea associations are among the soils in the county that are best suited to general farming. Wetness is the major limitation if the Capac soils are farmed.

Most of the soils in the county are well suited or moderately well suited to woodland. The Oakville association has the largest areas of woodland in the county. Woodland, wildlife habitat, and recreation are good uses of this association.

The major soils in the Oshtemo-Chelsea-Ockley and Oakville associations are examples of soils that are suited to recreational development. Dune land along Lake Michigan and the sandy plains in the Oakville association provide unique opportunities for recreation uses. The Oshtemo-Chelsea-Ockley association has hardwood forests, which enhance parks and other recreation areas. Slope is a limitation affecting most recreation uses in many areas of these soils.

Most of the soils in the county are suited to habitat for upland or wetland wildlife. The undrained areas of organic soils, which provide habitat for many species of wetland wildlife, are good nature study areas.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Oakville fine sand, 0 to 6 percent slopes, is one of several phases in the Oakville series.

Some map units are made up of two or more major soils. These map units are called soil complexes or undifferentiated groups.

A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Oshtemo-Chelsea complex, 6 to 12 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in the mapped areas are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Aquents and Histosols, ponded, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Some of the boundaries on the detailed soil maps of Allegan County do not match those on the soil maps of adjacent counties, and some of the soil names and descriptions do not fully agree. Differences are the result of modifications or refinements in soil series concepts or variations in the intensity of mapping or in the extent of the soils within the survey areas.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

2—Glendora loamy sand. This nearly level, poorly drained soil is on flood plains along rivers and streams. It is frequently flooded and ponded. Individual areas are long and narrow and range from 10 to more than 200 acres in size.

Typically, the surface layer is black loamy sand about 10 inches thick. The substratum to a depth of about 60 inches is multicolored fine sand and sand.

Included with this soil in mapping are small areas of the very poorly drained Adrian and Houghton soils and the poorly drained Sebewa soils. These soils are in landscape positions similar to those of the Glendora soil. They make up 10 to 15 percent of the unit. Houghton and Adrian soils are organic. Sebewa soils have a loamy surface layer and subsoil. Also included, on the flood

plains along the Kalamazoo and Rabbit Rivers, are escarpments, which commonly adjoin the uplands.

Permeability is rapid in the Glendora soil. Available water capacity is low. Surface runoff is very slow or ponded. The seasonal high water table is at or near the surface from November through June and in extremely wet periods during the rest of the year.

Most of the acreage is woodland or idle land. Some areas are used as cropland. Because of the wetness and the flooding, this soil is generally unsuited to cropland. It is poorly suited to woodland. The major management concerns in the wooded areas are the equipment limitation, seedling mortality, and the windthrow hazard. Equipment should be used only during periods when the soil is relatively dry or frozen. Special site preparation, such as bedding before planting, reduces the seedling mortality rate in some areas. Carefully thinning the stands or not thinning them at all and applying harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

This soil is not suited to building site development or septic tank absorption fields because of the flooding and the wetness.

The land capability classification is VIw. The Michigan soil management group is L-4c.

4—Dune land and Beaches. This map unit consists of undulating to steep sand dunes, nearly level beaches, and steep sandy, loamy, and clayey escarpments along Lake Michigan. Individual areas range from 4 to 300 acres in size.

In most areas the sand dunes have no protective plant cover and are actively shifting. Beach areas are typically fine sand at the surface and become coarser textured with increasing depth. They are frequently flooded and are subject to ice buildup during the winter. The escarpments are adjacent to the beaches. Erosion, seepage, and instability are the major management concerns in these areas.

This unit is unsuited to cropland, woodland, and building site development. Many areas are used for recreational development.

This unit is not assigned to interpretive groups.

5—Houghton muck. This nearly level, very poorly drained soil is in low areas along drainageways and in depressions. It is frequently ponded. Individual areas are irregular in shape and range from 3 to 500 acres in size.

Typically, the surface layer is black muck about 12 inches thick. Below this to a depth of about 60 inches is dark reddish brown and black muck. In places the muck is less than 51 inches thick.

Included with this soil in mapping are areas where the soil is subject to flooding. These areas are on the flood plains along the Kalamazoo and Rabbit Rivers. Also included are areas where escarpments commonly adjoin the uplands.

Permeability is moderately slow to moderately rapid in the Houghton soil. Available water capacity is high. Surface runoff is very slow or ponded. The seasonal high water table is near or above the surface from September through June and during extremely wet periods in July and August.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

If drained, this soil is moderately well suited to corn and to specialty crops, such as blueberries, carrots, onions, celery, and potatoes. The major management concerns are excessive wetness and soil blowing. A surface or subsurface drainage system helps to lower the water table. Field windbreaks, buffer strips, vegetative barriers, and cover crops help to control soil blowing. Flooding is a hazard along watercourses.

This soil is moderately well suited to woodland. The major management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. Equipment should be used only during periods when the soil is frozen. The use of special equipment that does not damage surface root systems and harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Because of the wetness and the ponding, establishing planting stock is difficult.

This soil is not suited to building site development or septic tank absorption fields because of the ponding and low strength.

The land capability classification is IIIw. The Michigan soil management group is Mc.

6—Adrian muck. This nearly level, very poorly drained soil is on low flats, along drainageways, and in depressions. It is frequently ponded. Individual areas are irregular in shape and range from 2 to 400 acres in size.

Typically, the surface layer is black, very friable muck about 13 inches thick. Below this is black, friable muck about 21 inches thick. The substratum to a depth of about 60 inches is grayish brown sand. In some areas the muck is more than 51 inches thick. In other areas thin layers of loamy and marly material underlie the muck.

Permeability is moderately slow to moderately rapid in the layers of muck and rapid in the sandy substratum. Available water capacity is high. Surface runoff is very slow or ponded. The seasonal high water table is near or above the surface from November through May and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

This soil is poorly suited to cropland, but corn, soybeans, and specialty crops, such as potatoes, blueberries, onions, carrots, celery, and asparagus, can be grown (fig. 4). Undrained areas are generally unsuited

to crops. The major management concerns are excess water and soil blowing. A surface or subsurface drainage system helps to lower the water table. Field windbreaks, buffer strips, vegetative barriers, and cover crops help to control soil blowing. Flooding is a hazard along watercourses.

This soil is moderately well suited to woodland. The major management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. Equipment should be used only during periods when the soil is frozen. The use of special equipment that does not damage surface root systems and harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Because of the wetness and the ponding, establishing planting stock is difficult.

Because of the ponding and low strength, this soil is not suited to building site development or septic tank absorption fields.

The land capability classification is IVw. The Michigan soil management group is M/4c.

7—Palms muck. This nearly level, very poorly drained soil is on low flats, along drainageways, and in depressions. It is frequently ponded. Individual areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is black muck about 12 inches thick. Below this is dark reddish brown muck about 10 inches thick. The substratum to a depth of about 60 inches is very dark gray and dark gray, mottled silt loam and silty clay loam. In some places the muck is more than 51 inches thick. In other places it is less than 16 inches thick.

Permeability is moderately slow to moderately rapid in the layers of muck and moderately slow or moderate in the loamy substratum. Available water capacity is high. Surface runoff is very slow or ponded. The seasonal high water table is near or above the surface from November through May and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

If drained, this soil is moderately well suited to corn, soybeans, small grain, and specialty crops, such as

Figure 4.—Onions in an area of Adrian muck.

blueberries, onions, potatoes, carrots, and celery. The major management concerns are excess water and soil blowing. A surface or subsurface drainage system helps to lower the water table. Field windbreaks, buffer strips, vegetative barriers, and cover crops help to control soil blowing. Flooding is a hazard along watercourses.

This soil is moderately well suited to woodland. The major management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. Equipment should be used only during periods when the soil is frozen. The use of special equipment that does not damage surface root systems and harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Because of the wetness and the ponding, establishing planting stock is difficult.

This soil is not suited to building site development or septic tank absorption fields because of the ponding and low strength.

The land capability classification is IIIw. The Michigan soil management group is M/3c.

8B—Glynwood clay loam, 1 to 6 percent slopes. This nearly level and undulating, moderately well drained soil is on low knolls and side slopes. Individual areas are irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is dark brown clay loam about 10 inches thick. The subsoil is dark yellowish brown and dark brown, mottled clay about 19 inches thick. The substratum to a depth of about 60 inches is yellowish brown, mottled, calcareous clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Blount soils in small depressions, in natural waterways, and on foot slopes. These soils make up 5 to 10 percent of the unit.

Permeability is slow in the Glynwood soil. Available water capacity is moderate. Surface runoff is rapid. The seasonal high water table is at a depth of 2.0 to 3.5 feet from late in fall to early in spring.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

This soil is well suited to corn, soybeans, small grain, and specialty crops, such as apples and pears. The major management concerns are water erosion, poor tilth, and compaction. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface helps to prevent excessive soil loss. Cropping systems dominated by small grain, cover crops, green manure crops, and hay also help to control erosion. Returning crop residue to the soil or regularly adding other organic material improves tilth and fertility, helps to prevent crusting, and increases the rate of water infiltration. Delaying tillage when the soil is wet helps to prevent compaction and the development of poor soil structure.

This soil is moderately well suited to woodland. The major management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. During wet periods, the soil is sticky and slippery and ruts can easily form. Equipment should be used only during periods when the soil is relatively dry or frozen. Planting containerized stock increases the seedling survival rate. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the wetness and the shrink-swell potential, this soil is poorly suited to building site development. Buildings with basements can be constructed on well compacted fill material, which raises the site. A drainage system helps to lower the water table. The shrink-swell potential can be overcome by widening the foundation trench and then backfilling with suitable coarse textured material.

Because of the wetness and the slow permeability, this soil is poorly suited to septic tank absorption fields. Filling or mounding the site with suitable material helps to raise the absorption field above the seasonal high water table. A pressurized disposal system helps to overcome the slow permeability.

The land capability classification is IIe. The Michigan soil management group is 1.5a.

8C—Glynwood clay loam, 6 to 12 percent slopes. This gently rolling, moderately well drained soil is on knolls, low ridges, and side slopes. Individual areas are irregular in shape and range from 4 to 80 acres in size.

Typically, the surface layer is dark brown clay loam about 8 inches thick. The subsoil is dark yellowish brown and dark brown, mottled clay loam about 21 inches thick. The substratum to a depth of about 60 inches is yellowish brown, mottled, calcareous clay loam.

Included with this soil in mapping are small areas of the well drained Marlette soils. These soils are in landscape positions similar to those of the Glynwood soil. Also included are small areas of the somewhat poorly drained Blount soils. These soils are in nearly level areas, in depressions, and along drainageways. Included soils make up 5 to 15 percent of the unit.

Permeability is slow in the Glynwood soil. Available water capacity is moderate. Surface runoff is rapid. The seasonal high water table is at a depth of 2.0 to 3.5 feet from late in fall to early in spring.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

This soil is moderately well suited to corn and well suited to small grain, soybeans, hay, and specialty crops, such as apples and pears. Water erosion, poor tilth, and compaction are the major management concerns. Grassed waterways and a system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface help to prevent excessive soil loss. Cropping systems dominated by small grain, hay, green manure crops, and cover crops also help to control erosion. A subsurface drainage system can lower

the water table if adequate drainage outlets are available. Returning crop residue to the soil or regularly adding other organic material improves fertility and soil structure. Minimizing tillage and delaying tillage when the soil is wet help to prevent compaction and the development of poor soil structure.

This soil is moderately well suited to woodland. The major management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. During wet periods, the soil is sticky and slippery and ruts can easily form. Equipment should be used only during periods when the soil is relatively dry or frozen. Planting containerized stock increases the seedling survival rate. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the wetness and the shrink-swell potential, this soil is poorly suited to building site development. Buildings with basements can be constructed on well compacted fill material, which raises the site. A drainage system helps to lower the water table. The shrink-swell potential can be overcome by widening the foundation trench and then backfilling with suitable coarse textured material. The buildings should be designed so that they conform to the natural slope of the land.

Because of the wetness and the slow permeability, this soil is poorly suited to septic tank absorption fields. Filling or mounding the site with suitable material helps to raise the absorption field above the seasonal high water table. A pressurized disposal system helps to overcome the slow permeability.

The land capability classification is IIIe. The Michigan soil management group is 1.5a.

10B—Oakville fine sand, 0 to 6 percent slopes. This nearly level and undulating, well drained soil is on low knolls and plains. Individual areas are irregular in shape and range from 4 to 3,000 acres in size.

Typically, the surface layer is dark brown fine sand about 9 inches thick. The subsoil is yellowish brown fine sand about 15 inches thick. The substratum to a depth of about 60 inches is brownish yellow fine sand. In some areas thin bands of loamy fine sand are in the substratum. In other areas the subsoil is redder.

Included with this soil in mapping are small areas of the somewhat poorly drained Tedrow and Morocco soils in the lower landscape positions. Also included are steep escarpments bordering flood plains and ravines. Included soils make up 10 to 15 percent of the unit.

Permeability is rapid in the Oakville soil. Available water capacity is low. Surface runoff is very slow.

Most areas of this soil are used as woodland. Some of the acreage is cropland or idle land.

This soil is poorly suited to crops, but corn, small grain, potatoes, asparagus, peaches, and cherries can be grown. The major management concerns are droughtiness and soil blowing. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface helps to prevent excessive soil loss. Cover crops, buffer strips, vegetative barriers, and field windbreaks also help to control soil blowing. Returning crop residue to the soil, growing green manure crops, or regularly adding other organic material improves fertility and the available water capacity. Irrigation is needed during the drier summer months. Because of the limited amount of available water, small grain should be planted early in spring or fall-seeded crops, such as rye or winter wheat, should be grown.

This soil is moderately well suited to woodland. The major management concerns are seedling mortality and the equipment limitation. Special site preparation, such as furrowing or applying herbicides before planting, and selection of planting stock that is more than 2 years old or is containerized reduce the seedling mortality rate. Using carefully selected logging roads and wide-tracked equipment and limiting equipment use to periods when the soil is frozen or moist help to overcome the equipment limitation.

This soil is well suited to building site development and moderately well suited to septic tank absorption fields. It readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water supplies. Special construction methods, such as filling or mounding the site with suitable material, may be needed to increase the filtering capacity.

The land capability classification is IVs. The Michigan soil management group is 5a.

10C—Oakville fine sand, 6 to 18 percent slopes. This gently rolling and rolling, well drained soil is on knolls, ridges, and side slopes. Individual areas are irregular in shape and range from 4 to 700 acres in size.

Typically, the surface layer is dark brown fine sand about 3 inches thick. The subsoil is yellowish brown fine sand about 21 inches thick. The substratum to a depth of about 60 inches is brownish yellow fine sand. In some areas thin bands of loamy fine sand are in the substratum.

Included with this soil in mapping are small areas of the somewhat poorly drained Tedrow and Morocco soils on foot slopes and in depressions. These soils make up 1 to 3 percent of the unit.

Permeability is rapid in the Oakville soil. Available water capacity is low. Surface runoff is slow.

Most areas are used as woodland. Some are used as cropland. Because of droughtiness and the slope, this soil is generally unsuited to cropland. It is well suited to woodland. The major management concerns in the wooded areas are seedling mortality and the equipment limitation. Special site preparation, such as furrowing on the contour or applying herbicides before planting, and selection of planting stock that is more than 2 years old

or is containerized reduce the seedling mortality rate. Using carefully selected logging roads and wide-tracked equipment and limiting equipment use to periods when the soil is frozen or moist help to overcome the equipment limitation.

This soil is moderately well suited to building site development and poorly suited to septic tank absorption fields. The slope is a limitation on building sites. It can be overcome by land shaping and by designing the buildings so that they conform to the natural slope of the land. The slope and a poor filtering capacity are limitations on sites for septic tank absorption fields. Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly. The soil readily absorbs but does not adequately filter the effluent from septic tanks. The poor filtering capacity may result in the pollution of ground water supplies.

The land capability classification is VIs. The Michigan soil management group is 5a.

10E—Oakville fine sand, 18 to 45 percent slopes. This hilly to steep, well drained soil is on hills, side slopes, and ridges. Individual areas are irregular in shape and range from 4 to 300 acres in size.

Typically, the surface layer is dark brown fine sand about 2 inches thick. The subsoil is yellowish brown fine sand about 22 inches thick. The substratum to a depth of about 60 inches is brownish yellow fine sand. In some areas thin bands of loamy fine sand are in the substratum.

Included with this soil in mapping are small areas of the somewhat poorly drained Tedrow and Morocco soils on foot slopes and in depressions. These soils make up 2 to 8 percent of the unit.

Permeability is rapid in the Oakville soil. Available water capacity is low. Surface runoff is medium.

Most areas are used as woodland. Some of the acreage is idle land. Because of droughtiness and the slope, this soil is unsuited to crops. It is well suited to woodland. The major management concerns in the wooded areas are the erosion hazard, the equipment limitation, and seedling mortality. Because of the erosion hazard, logging roads, skid trails, and landings should be established on gentle grades and water should be removed by water bars, out-sloping road surfaces, culverts, and drop structures. Caution is needed when harvesting equipment is operated on the steeper slopes. Furrowing on the contour or applying herbicides reduces the seedling mortality rate and helps to control erosion. Selection of planting stock that is more than 2 years old or is containerized increases the seedling survival rate. Using carefully selected logging roads and wide-tracked equipment and limiting equipment use to periods when the soil is frozen or moist help to overcome the equipment limitation.

This soil is generally unsuited to building site development and septic tank absorption fields because of the slope.

The land capability classification is VIIs. The Michigan soil management group is 5a.

11B—Oshtemo-Chelsea complex, 0 to 6 percent slopes. These nearly level and undulating soils are on knolls, ridges, and plains. The Oshtemo soil is well drained, and the Chelsea soil is somewhat excessively drained. Individual areas are irregular in shape and range from 4 to 400 acres in size. They are 60 to 70 percent Oshtemo soil and 20 to 35 percent Chelsea soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the Oshtemo soil has a surface layer of dark brown loamy sand about 10 inches thick. The subsoil is about 25 inches thick. The upper part is dark yellowish brown sandy loam, and the lower part is strong brown sandy clay loam. Below this to a depth of about 60 inches is strong brown sand that has bands of loamy sand. In places the upper part of the subsoil is loamy sand.

Typically, the Chelsea soil is covered by very dark brown leaf litter about 1 inch thick. The surface layer is very dark brown loamy fine sand about 4 inches thick. The subsurface layer is dark yellowish brown fine sand about 25 inches thick. Below this to a depth of about 60 inches is brownish yellow fine sand that has thin bands of strong brown loamy fine sand. In some places the bands below the subsurface layer are loamy sand and sandy loam and total more than 6 inches thick. In other places the soil has no bands.

Included with these soils in mapping are small areas of the somewhat poorly drained Brady and well drained Ockley soils. Brady soils are in drainageways and depressions. Ockley soils are finer textured than the Oshtemo and Chelsea soils. They are in positions on the landscape similar to those of the Oshtemo and Chelsea soils. Included soils make up 5 to 10 percent of the unit.

In areas of the Oshtemo soil, permeability is moderately rapid, available water capacity is moderate, and surface runoff is slow. In areas of the Chelsea soil, permeability is rapid, available water capacity is low, and surface runoff is medium.

Most areas of these soils are used as cropland or woodland. Some of the acreage is idle land.

These soils are moderately well suited to corn, soybeans, small grain, hay, and specialty crops, such as potatoes, asparagus, and fruit trees. The major management concerns are soil blowing and droughtiness. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface helps to prevent excessive soil loss. Cover crops, buffer strips, vegetative barriers, and field windbreaks help to control soil blowing and conserve moisture. Because of the limited amount of

available water, small grain should be planted early in spring or fall-seeded crops, such as rye or winter wheat, should be grown. Returning crop residue to the soil, growing green manure crops, or regularly adding other organic material improves fertility and the available water capacity. Irrigation is needed during the drier midsummer months.

These soils are well suited to woodland. The major management concern is seedling mortality. Special site preparation, such as furrowing or applying herbicides before planting, and selection of planting stock that is more than 2 years old or is containerized increase the seedling survival rate.

These soils are well suited to building site development. The Oshtemo soil is well suited to septic tank absorption fields. The Chelsea soil readily absorbs but does not adequately filter the effluent from septic tanks. The poor filtering capacity may result in the pollution of ground water supplies.

The land capability classification is IIIs. The Michigan soil management groups are 4a and 5a.

11C—Oshtemo-Chelsea complex, 6 to 12 percent slopes. These gently rolling soils are on knolls, ridges, and side slopes. The Oshtemo soil is well drained, and the Chelsea soil is somewhat excessively drained. Individual areas are irregular in shape and range from 4 to 400 acres in size. They are 50 to 65 percent Oshtemo soil and 30 to 40 percent Chelsea soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the Oshtemo soil has a surface layer of dark brown loamy sand about 8 inches thick. The subsoil is about 27 inches thick. The upper part is dark yellowish brown sandy loam, and the lower part is strong brown sandy clay loam. Below this to a depth of about 60 inches is strong brown sand that has bands of loamy sand. In places the upper part of the subsoil is loamy sand.

Typically, the Chelsea soil is covered by very dark brown leaf litter about 1 inch thick. The surface layer is very dark brown loamy fine sand about 3 inches thick. The subsurface layer is dark yellowish brown fine sand about 26 inches thick. Below this to a depth of about 60 inches is brownish yellow fine sand that has thin bands of strong brown loamy fine sand. In some places the bands below the subsurface layer are loamy sand and sandy loam and total more than 6 inches thick. In other places the soil has no bands.

Included with these soils in mapping are small areas of the somewhat poorly drained Brady and well drained Ockley soils. Brady soils are in drainageways and depressions. Ockley soils are finer textured than the Oshtemo and Chelsea soils. They are in positions on the landscape similar to those of the Oshtemo and Chelsea soils. Included soils make up 5 to 10 percent of the unit.

In the Oshtemo soil, permeability is moderately rapid and available water capacity is moderate. In the Chelsea soil, permeability is rapid and available water capacity is low. Surface runoff is medium on both soils.

Most of the acreage of these soils is cropland or idle land. Some areas are used as woodland.

These soils are poorly suited to crops, but corn, small grain, and hay can be grown. The soils are moderately well suited to most fruit trees. The major management concerns are soil blowing, water erosion, and droughtiness. A system of conservation tillage that does not invert the soil and that leaves all or part of the crop residue on the surface, grassed waterways, and field windbreaks help to prevent excessive soil loss. A cropping system dominated by small grain, hay, and cover crops also helps to control erosion. Because of the limited amount of available water, small grain or green manure crops should be planted early in spring or fall-seeded crops, such as rye or winter wheat, should be grown.

These soils are well suited to woodland. The major management concern is seedling mortality. Special site preparation, such as furrowing on the contour or applying herbicides before planting, and selection of planting stock that is more than 2 years old or is containerized increase the seedling survival rate.

These soils are moderately well suited to building site development. The slope is a limitation on sites for buildings and septic tank absorption fields. The buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas. Land shaping and installing the distribution lines across the slope help to ensure that septic tank absorption fields function properly. The Chelsea soil readily absorbs but does not adequately filter the effluent from septic tanks. The poor filtering capacity may result in the pollution of ground water supplies.

The land capability classification is IIIe. The Michigan soil management groups are 4a and 5a.

11D—Oshtemo-Chelsea complex, 12 to 18 percent slopes. These rolling soils are on knolls, ridges, and side slopes. The Oshtemo soil is well drained, and the Chelsea soil is somewhat excessively drained. Individual areas are irregular in shape and range from 5 to 250 acres in size. They are 50 to 65 percent Oshtemo soil and 30 to 40 percent Chelsea soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the Oshtemo soil has a surface layer of dark brown loamy sand about 6 inches thick. The subsoil is about 29 inches thick. The upper part is dark yellowish brown sandy loam, and the lower part is strong brown sandy clay loam. Below this to a depth of about 60 inches is strong brown sand that has bands of loamy sand. In places the upper part of the subsoil is loamy sand.

Typically, the Chelsea soil is covered by very dark brown leaf litter about 1 inch thick. The surface layer is very dark brown loamy fine sand about 2 inches thick. The subsurface layer is dark yellowish brown fine sand about 27 inches thick. Below this to a depth of about 60 inches is brownish yellow fine sand that has thin bands of strong brown loamy fine sand. In some places the bands below the subsurface layer are loamy sand and sandy loam and total more than 6 inches thick. In other places the soil has no bands.

Included with these soils in mapping are small areas of the somewhat poorly drained Brady and well drained Ockley soils. Brady soils are in drainageways and depressions. Ockley soils are finer textured than the Oshtemo and Chelsea soils. They are in positions on the landscape similar to those of the Oshtemo and Chelsea soils. Included soils make up 5 to 10 percent of the unit.

In the Oshtemo soil, permeability is moderately rapid and available water capacity is moderate. In the Chelsea soil, permeability is rapid and available water capacity is low. Surface runoff is medium on both soils.

Most of the acreage of these soils is woodland or idle land. Some areas are used as cropland. Because of the slope and droughtiness, these soils are generally unsuited to cropland. They are well suited to woodland. The major management concern in the wooded areas is seedling mortality. Special site preparation, such as furrowing on the contour or applying herbicides before planting, and selection of planting stock that is more than 2 years old or is containerized increase the seedling survival rate.

These soils are poorly suited to building site development and septic tank absorption fields. The slope is a limitation on sites for buildings. The slope and a poor filtering capacity in the Chelsea soil are limitations on sites for septic tank absorption fields. Buildings should be designed so that they conform to the natural slope of the land. Land shaping and installing the distribution lines across the slope help to ensure that septic tank absorption fields function properly. The Chelsea soil readily absorbs but does not adequately filter the effluent from septic tanks. The poor filtering capacity may result in the pollution of ground water supplies.

The land capability classification is VIe. The Michigan soil management groups are 4a and 5a.

11E—Oshtemo-Chelsea complex, 18 to 35 percent slopes. These hilly and very hilly soils are on side slopes, hills, and ridges. The Oshtemo is soil well drained, and the Chelsea soil is somewhat excessively drained. Individual areas are irregular in shape and range from 4 to 70 acres in size. They are 50 to 65 percent Oshtemo soil and 35 to 50 percent Chelsea soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the Oshtemo soil has a surface layer of dark brown loamy sand about 4 inches thick. The subsoil is about 31 inches thick. The upper part is dark yellowish brown sandy loam, and the lower part is strong brown sandy clay loam. Below this to a depth of about 60 inches is strong brown sand that has bands of loamy sand. In places the upper part of the subsoil is loamy sand.

Typically, the Chelsea soil is covered by very dark brown leaf litter about 1 inch thick. The surface layer is very dark brown loamy fine sand about 2 inches thick. The subsurface layer is dark yellowish brown fine sand about 27 inches thick. Below this to a depth of about 60 inches is brownish yellow fine sand that has thin bands of strong brown loamy fine sand. In some places the bands below the subsurface layer are loamy sand and sandy loam and total more than 6 inches thick. In other places the soil has no bands.

Included with these soils in mapping are small areas of the somewhat poorly drained Brady and well drained Ockley soils. Brady soils are in drainageways and depressions. Ockley soils are finer textured than the Oshtemo and Chelsea soils. They are in positions on the landscape similar to those of the Oshtemo and Chelsea soils. Included soils make up 5 to 10 percent of the unit.

In the Oshtemo soil, permeability is moderately rapid and available water capacity is moderate. In the Chelsea soil, permeability is rapid and available water capacity is low. Surface runoff is medium on both soils.

Most of the acreage is woodland or idle land. Because of the slope, these soils are unsuited to crops. They are well suited to woodland. The major management concerns in the wooded areas are the erosion hazard, the equipment limitation, and seedling mortality. Because of the erosion hazard, logging roads, skid trails, and landings should be established on gentle grades and water should be removed by water bars, out-sloping road surfaces, culverts, and drop structures. Caution is needed when harvesting equipment is operated on the steeper slopes. Furrowing on the contour, applying herbicides, and selecting planting stock that is more than 2 years old or is containerized increase the seedling survival rate.

These soils are generally unsuited to building site development and septic tank absorption fields because of the slope.

The land capability classification is VIIe. The Michigan soil management groups are 4a and 5a.

12B—Ockley loam, 1 to 6 percent slopes. This nearly level and undulating, well drained soil is on slightly convex plains, knolls, and ridges. Individual areas are irregular in shape and range from 10 to 1,500 acres in size.

Typically, the surface layer is dark grayish brown loam about 11 inches thick. The subsoil is about 31 inches thick. It is dark brown. The upper part is sandy clay

loam, the next part is sandy loam, and the lower part is sandy clay loam. The substratum to a depth of about 60 inches is dark brown gravelly sand. In places the surface layer and subsoil are coarser textured.

Included with this soil in mapping are small areas of the somewhat excessively drained Chelsea and somewhat poorly drained Brady soils. These soils are coarser textured than the Ockley soil. Chelsea soils are in landscape positions similar to those of the Ockley soil. Brady soils are in depressions and drainageways. Included soils make up 10 to 15 percent of the unit.

Permeability and available water capacity are moderate in the Ockley soil. Surface runoff is slow.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

This soil is well suited to corn, soybeans, small grain, hay, and specialty crops, such as potatoes, asparagus, and fruit trees. The major management concerns are water erosion and compaction. Cover crops and a system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface help to control erosion. Returning crop residue to the soil, planting green manure crops, or regularly adding other organic material improves fertility, available water capacity, and soil structure. Minimizing tillage and delaying tillage when soil is wet help to prevent compaction and the development of poor soil structure. Irrigation increases productivity.

This soil is well suited to woodland. No major hazards or limitations affect planting or harvesting.

This soil is well suited to building site development and septic tank absorption fields. The shrink-swell potential is a limitation on building sites. It can be overcome by widening the foundation trench and then backfilling with suitable coarse textured material.

The land capability classification is IIe. The Michigan soil management group is 2.5a.

12C—Ockley loam, 6 to 12 percent slopes. This gently rolling, well drained soil is on side slopes, knolls, and ridges. Individual areas are irregular in shape and range from 5 to 300 acres in size.

Typically, the surface layer is dark grayish brown loam about 10 inches thick. The subsoil is about 31 inches thick. It is dark brown. The upper part is sandy clay loam, the next part is sandy loam, and the lower part is sandy clay loam. The substratum to a depth of about 60 inches is dark brown gravelly sand. In places the surface layer and subsoil are coarser textured.

Included with this soil in mapping are small areas of the somewhat poorly drained Brady soils in depressions and drainageways. These soils make up 5 to 10 percent of the unit.

Permeability and available water capacity are moderate in the Ockley soil. Surface runoff is medium.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

This soil is moderately well suited to corn, soybeans, small grain, hay, and specialty crops, such as fruit trees. The major management concerns are water erosion and compaction. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface helps to prevent excessive soil loss. Cover crops, grassed waterways, and a cropping system dominated by small grain and hay also help to control erosion. Returning crop residue to the soil, planting green manure crops, or regularly adding other organic material improves fertility, available water capacity, and soil structure. Minimizing tillage and delaying tillage when the soil is wet help to prevent compaction and alteration of soil structure.

This soil is well suited to woodland. No major hazards or limitations affect planting or harvesting.

This soil is moderately well suited to building site development and septic tank absorption fields. The slope is a limitation. Also, the shrink-swell potential is a limitation on building sites. It can be overcome by widening the foundation trench and then backfilling with suitable coarse textured material. Buildings should be designed so that they conform to the natural slope of the land. In some areas land shaping is needed. Land shaping and installing the distribution lines on the contour help to ensure that septic tank absorption fields function properly.

The land capability classification is IIIe. The Michigan soil management group is 2.5a.

12D—Ockley loam, 12 to 18 percent slopes. This rolling, well drained soil is on high knolls, ridges, and side slopes. Individual areas are irregular in shape and range from 5 to 130 acres in size.

Typically, the surface layer is dark grayish brown loam about 9 inches thick. The subsoil is about 31 inches thick. It is dark brown. The upper part is sandy clay loam, the next part is sandy loam, and the lower part is sandy clay loam. The substratum to a depth of about 60 inches is dark brown gravelly sand. In places the surface layer and subsoil are coarser textured.

Included with this soil in mapping are small areas of the somewhat poorly drained Brady soils in depressions and drainageways. These soils make up 10 to 15 percent of the unit.

Permeability and available water capacity are moderate in the Ockley soil. Surface runoff is rapid.

Most of the acreage of this soil is woodland or idle land. Some areas are used as cropland.

This soil is poorly suited to crops, but corn, small grain, and hay can be grown. The major management concerns are water erosion and compaction. Grassed waterways, a system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, and cropping systems dominated by small grain, cover crops, and hay help to control erosion. A permanent cover of grasses also is effective

in controlling erosion. Minimizing tillage and delaying tillage when the soil is wet help to prevent compaction and alteration of soil structure.

This soil is well suited to woodland. No major hazards or limitations affect planting or harvesting.

Because of the slope, this soil is poorly suited to building site development and septic tank absorption fields. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas. The shrink-swell potential is a limitation on building sites. It can be overcome by widening the foundation trench and then backfilling with suitable coarse textured material. Installing the distribution lines across the slope helps to ensure that septic tank absorption fields function properly.

The land capability classification is IVe. The Michigan soil management group is 2.5a.

12E—Ockley loam, 18 to 30 percent slopes. This hilly and very hilly, well drained soil is on hills, ridges, and side slopes. Individual areas are irregular in shape and range from 4 to 70 acres in size.

Typically, the surface layer is dark grayish brown loam about 6 inches thick. The subsoil is about 35 inches thick. It is dark brown. The upper part is sandy clay loam, the next part is sandy loam, and the lower part is sandy clay loam. The substratum to a depth of about 60 inches is dark brown gravelly sand. In places the surface layer and subsoil are coarser textured.

Included with this soil in mapping are small areas of the somewhat poorly drained Brady soils in depressions and drainageways. These soils make up 10 to 15 percent of the unit.

Permeability and available water capacity are moderate in the Ockley soil. Surface runoff is rapid.

Most of the acreage is woodland or idle land. Because of the slope, this soil is unsuited to crops. It is well suited to woodland. The major management concerns in the wooded areas are the erosion hazard and the equipment limitation. Because of the erosion hazard, logging roads, skid trails, and landings should be established on gentle grades and water should be removed by water bars, out-sloping road surfaces, culverts, and drop structures. Caution is needed if harvesting equipment is operated on the steeper slopes.

This soil is generally unsuited to building site development and septic tank absorption fields because of the slope.

The land capability classification is VIe. The Michigan soil management group is 2.5a.

14C—Marlette loam, 6 to 12 percent slopes. This gently rolling, well drained soil is on side slopes, knolls, and ridges. Individual areas are irregular in shape and range from 4 to 200 acres in size.

Typically, the surface layer is brown loam about 9 inches thick. The next 14 inches is mixed brown clay loam and pale brown loam. The subsoil is brown clay loam about 14 inches thick. The substratum to a depth of about 60 inches is brown loam and dark brown clay loam. In some places the depth to the substratum is more than 50 inches. In other places erosion has removed the surface layer, exposing the subsoil.

Included with this soil in mapping are small areas of the well drained Oshtemo and somewhat poorly drained Capac soils. Oshtemo soils are more droughty than the Marlette soil. They are in landscape positions similar to those of the Marlette soil. Capac soils are in depressions and drainageways. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately slow in the Marlette soil. Available water capacity is high. Surface runoff is rapid in cultivated areas.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

This soil is moderately well suited to corn, soybeans, small grain, hay, and most types of fruit trees. The major management concerns are water erosion and compaction. Grassed waterways and a system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface help to prevent excessive soil loss. A cropping system dominated by small grain, hay, and cover crops also helps to control erosion. Minimizing tillage and delaying tillage when the soil is wet help to prevent compaction and alteration of soil structure.

This soil is well suited to woodland. No major hazards or limitations affect planting or harvesting.

Because of the slope, this soil is only moderately well suited to building site development. It is poorly suited to septic tank absorption fields because of the slope and the moderately slow permeability. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas. Land shaping and installing the distribution lines across the slope help to ensure that septic tank absorption fields function properly. Enlarging the absorption field or installing a pressurized disposal system or alternating drain fields helps to overcome the moderately slow permeability.

The land capability classification is IIIe. The Michigan soil management group is 2.5a.

14D—Marlette loam, 12 to 18 percent slopes. This rolling, well drained soil is on high knolls and side slopes. Individual areas are irregular in shape and range from 4 to 250 acres in size.

Typically, the surface layer is brown loam about 8 inches thick. The next 14 inches is mixed brown clay loam and pale brown loam. The subsoil is brown clay loam about 14 inches thick. The substratum to a depth of about 60 inches is brown loam and dark brown clay loam. In some places erosion has removed the surface

layer, exposing the subsoil. In other places the subsoil is clay.

Included with this soil in mapping are small areas of the well drained Oshtemo soils, the somewhat excessively drained Chelsea soils, and the somewhat poorly drained Capac soils. Oshtemo and Chelsea soils are in landscape positions similar to those of the Marlette soil. They are coarser textured and more droughty than the Marlette soil. Capac soils are in depressions and drainageways. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately slow in the Marlette soil. Available water capacity is high. Surface runoff is rapid.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

This soil is poorly suited to crops, but small grain and hay can be grown. The major management concern is water erosion. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, grassed waterways, and a cropping system dominated by small grain, cover crops, and hay help to prevent excessive soil loss.

This soil is well suited to woodland. No major hazards or limitations affect planting or harvesting.

This soil is poorly suited to building site development and septic tank absorption fields. The slope is a limitation. Also, the moderately slow permeability is a limitation in septic tank absorption fields. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas. Land shaping and installing the distribution lines across the slope help to ensure that septic tank absorption fields function properly. Enlarging the absorption field and installing a pressurized disposal system help to overcome the moderately slow permeability.

The land capability classification is IVe. The Michigan soil management group is 2.5a.

14E—Marlette loam, 18 to 35 percent slopes. This hilly and very hilly, well drained soil is on hills, ridges, and side slopes. Individual areas are irregular in shape and range from 4 to 150 acres in size.

Typically, the surface layer is brown loam about 6 inches thick. The next 12 inches is mixed brown clay loam and pale brown loam. The subsoil is brown clay loam about 14 inches thick. The substratum to a depth of about 60 inches is brown loam and dark brown clay loam. In some eroded areas, the subsoil is exposed. In places it is clay.

Included with this soil in mapping are small areas of the well drained Oshtemo soils, the somewhat excessively drained Chelsea soils, and the somewhat poorly drained Capac soils. Oshtemo soils and Chelsea soils are in landscape positions similar to those of the Marlette soil. They are coarser textured and more droughty than the Marlette soil. Capac soils are in depressions and drainageways. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately slow in the Marlette soil. Available water capacity is high. Surface runoff is rapid in wooded areas.

Most of the acreage is wooded. Because of the slope, this soil is generally unsuited to crops. It is well suited to woodland. The major management concerns are the erosion hazard and the equipment limitation, both of which are caused by the slope. Because of the erosion hazard, logging roads, skid trails, and landings should be established on gentle grades and water should be removed by water bars, out-sloping road surface, culverts, and drop structures. Caution is needed if harvesting equipment is operated on the steeper slopes.

This soil is generally unsuited to building site development and septic tank absorption fields because of the slope.

The land capability classification is VIIe. The Michigan soil management group is 2.5a.

15B—Morocco-Newton complex, 0 to 3 percent slopes. These nearly level soils are on plains and in depressions and drainageways. The Morocco soil is somewhat poorly drained. The Newton soil is very poorly drained and is frequently ponded. Individual areas are irregular in shape and range from 5 to 1,500 acres in size. They are 40 to 50 percent Morocco soil and 30 to 40 percent Newton soil. The two soils occur as areas so small or so intricately mixed that mapping them separately is not practical.

Typically, the Morocco soil has a surface layer of black fine sand about 1 inch thick. The subsurface layer is reddish gray fine sand about 1 inch thick. The subsoil is mottled fine sand about 22 inches thick. The upper part is dark brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is pale brown and light yellowish brown, mottled fine sand.

Typically, the Newton soil has a surface layer of black mucky fine sand about 11 inches thick. The substratum to a depth of about 60 inches is fine sand. It is dark grayish brown in the upper part and pale brown in the lower part.

Included with these soils in mapping are small areas of the well drained or moderately well drained Oakville soils on the higher ridges and on the tops of knolls. These included soils make up 5 to 10 percent of the unit.

Permeability is rapid in the Morocco and Newton soils. Available water capacity is low. Surface runoff is very slow on the Morocco soil and very slow or ponded on the Newton soil. The seasonal high water table is at a depth of 1 to 2 feet from November through April in the Morocco soil. It is near or above the surface of the Newton soil from November through May. The water table also is high in extremely wet periods during other parts of the year.

Most areas of these soils are used as woodland. A significant acreage is cropland.

These soils are poorly suited to crops. If the soils are drained, however, corn, small grain, hay, and specialty crops, such as blueberries, can be grown. The major management concerns are wetness and soil blowing. A surface or subsurface drainage system can lower the water table, but drainage outlets are not readily available. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, cover crops, vegetative barriers, buffer strips, and field windbreaks help to control soil blowing.

These soils are moderately well suited to woodland. The major management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. Equipment should be used only during periods when the soil is relatively dry or frozen. Special site preparation, such as bedding before planting, can reduce the seedling mortality rate in some areas. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard.

Because of the ponding and the wetness, these soils are generally unsuited to building site development and septic tank absorption fields.

The land capability classification is IVw. The Michigan soil management groups are 5b and 5c.

16B—Capac loam, 0 to 6 percent slopes. This nearly level and undulating, somewhat poorly drained soil is on broad flats, low ridges, knolls, and foot slopes. Individual areas are irregular in shape and range from 4 to 1,500 acres in size.

Typically, the surface layer is dark grayish brown loam about 9 inches thick. The next 4 inches is a mixture of yellowish brown, mottled clay loam and light brownish gray sandy loam. The subsoil is yellowish brown, mottled clay loam about 14 inches thick. The substratum to a depth of about 60 inches is brown, firm clay loam and yellowish brown loam. In places the subsoil is less than 18 inches thick. In some areas the substratum is silty clay loam. In other areas it has bands of loamy sand. In places permeability is slow.

Included with this soil in mapping are small areas of the well drained or moderately well drained Marlette soils, the somewhat poorly drained Blount soils, and the poorly drained Brookston soils. Marlette soils are on high ridges and the tops of knolls. Blount soils are finer textured than the Capac soil. They are in positions on the landscape similar to those of the Capac soil. Brookston soils are in drainageways and depressions. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately slow in the Capac soil. Available water capacity is high. Surface runoff is slow or medium. The seasonal high water table is at a depth of 1 to 2 feet from November through May and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some of the acreage is idle land or woodland.

This soil is well suited to corn, soybeans, small grain, hay, and specialty crops, such as apples and pears. The major management concerns are water erosion, wetness, poor tilth, and compaction. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, cover crops, and grassed waterways help to prevent excessive soil loss. A combination of surface and subsurface drains reduces the wetness. Returning crop residue to the soil or regularly adding other organic material helps to prevent crusting, increases the rate of water infiltration, and improves tilth. Minimizing tillage and delaying tillage when the soil is wet help to prevent compaction.

This soil is well suited to woodland. The equipment limitation is the major management concern. Because the soil is sticky when wet, equipment should be used only during periods when the soil is relatively dry or frozen. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the wetness, this soil is poorly suited to building site development. It is poorly suited to septic tank absorption fields because of the wetness and the moderately slow permeability. If buildings are constructed on this soil, suitable fill material is needed to raise the site. Mounding the site with suitable material and installing a pressurized disposal system help to overcome the wetness and moderately slow permeability in septic tank absorption fields.

The land capability classification is IIe. The Michigan soil management group is 2.5b.

17—Brookston loam. This nearly level, very poorly drained soil is in depressions and drainageways. It is frequently ponded. Individual areas are irregular in shape and range from 4 to 150 acres in size.

Typically, the surface layer is very dark grayish brown loam about 10 inches thick. The subsoil is about 36 inches thick. It is mottled. The upper part is dark grayish brown loam, the next part is dark gray clay loam, and the lower part is dark grayish brown clay loam. The substratum to a depth of about 60 inches is gray clay loam. In some places the surface layer is less than 10 inches thick. In other places the subsoil and substratum are stratified.

Included with this soil in mapping are small areas of the poorly drained Corunna and Belleville soils and the somewhat poorly drained Capac soils. Corunna and Belleville soils are in landscape positions similar to those of the Brookston soil. They are coarser textured in the upper part than the Brookston soil. Capac soils are slightly higher on the landscape than the Brookston soil. Included soils make up 5 to 10 percent of the unit.

Permeability is moderate in the Brookston soil. Available water capacity is high. Surface runoff is very slow or ponded. The seasonal high water table is near or above the surface from November through May and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some are used as woodland.

If drained, this soil is well suited to corn, soybeans, small grain, and hay. The major management concerns are excess water and compaction. Also, the soil warms up slowly in the spring. A surface or subsurface drainage system can lower the water table if adequate drainage outlets are available. Minimizing tillage and delaying tillage when the soil is wet help to prevent compaction. Ridge tillage helps the soil to warm up and dry out in the spring, thus allowing earlier planting and faster germination.

This soil is well suited to woodland. The major management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. Equipment should be used only during periods when the soil is frozen. Special site preparation, such as bedding before planting, can reduce the seedling mortality rate in some areas. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard.

This soil is generally unsuited to building site development and septic tank absorption fields because of the ponding.

The land capability classification is IIw. The Michigan soil management group is 2.5c.

18—Pits. This map unit consists of open excavations from which soil and the underlying sand or gravel have been removed. The exposed underlying material generally is calcareous and supports few or no plants. Where the excavation extends below the water table, the bottom of the pit may be ponded seasonally or permanently. Individual areas range from 4 to 100 acres in size.

Many of the pits are actively mined. Some contain trash and rubbish. The suitability for different uses varies. Onsite investigation is needed to determine the suitability for any alternative use.

This unit is not assigned to interpretive groups.

19A—Brady sandy loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on plains and in small depressions and drainageways. Individual areas are irregular in shape and range from 3 to 300 acres in size.

Typically, the surface layer is dark brown sandy loam about 9 inches thick. The subsurface layer is brown sandy loam about 3 inches thick. The subsoil is about 43 inches thick. It is mottled. In sequence downward, it is strong brown loam, yellowish brown loamy sand, strong brown sandy clay loam, and dark yellowish brown loamy sand. The substratum to a depth of about 60 inches is grayish brown coarse sand. In some areas the subsoil is banded fine sand and loamy fine sand. In other areas the substratum is acid. In places the surface layer is lighter colored.

Included with this soil in mapping are small areas of the well drained Oshtemo and poorly drained Sebewa soils. Oshtemo soils are on the crest of small knolls and ridges. Sebewa soils are in depressions and drainageways. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately rapid in the Brady soil. Available water capacity is moderate. Surface runoff is very slow. The seasonal high water table is at a depth of 1 to 3 feet from November through May and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some are used as woodland.

This soil is well suited to corn, soybeans, small grain, hay, and specialty crops, such as potatoes, asparagus, and apples. The major management concerns are wetness and soil blowing. A surface or subsurface drainage system helps to lower the water table. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface helps to prevent excessive soil loss. Cover crops, buffer strips, vegetative barriers, and field windbreaks also help to control soil blowing.

This soil is moderately well suited to woodland. The major management concerns are the equipment limitation and the windthrow hazard. Equipment should be used only during periods when the soil is relatively dry or frozen. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the wetness, this soil is poorly suited to building site development and septic tank absorption fields. Buildings can be constructed on well compacted fill material, which raises the site. A surface or subsurface drainage system helps to lower the water table. Special construction methods, such as filling or mounding with suitable material, may be needed to raise septic tank absorption fields above the water table. A pressurized disposal system also helps to overcome the wetness.

The land capability classification is IIw. The Michigan soil management group is 3b.

21B—Capac-Wixom complex, 1 to 4 percent slopes. These nearly level and undulating, somewhat poorly drained soils are on plains and in small depressions and drainageways. Individual areas are irregular in shape and range from 4 to 400 acres in size. They are 50 to 60 percent Capac soil and 25 to 35 percent Wixom soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the Capac soil has a surface layer of dark grayish brown loam about 9 inches thick. The next 4 inches is a mixture of yellowish brown, mottled clay loam and light brownish gray sandy loam. The subsoil is yellowish brown, mottled clay loam about 14 inches thick. The substratum to a depth of about 60 inches is brown and yellowish brown, mottled clay loam and loam.

Typically, the Wixom soil has a surface layer of very dark brown loamy sand about 9 inches thick. The subsoil is about 22 inches thick. It is mottled. In sequence downward, it is brown loamy sand; dark yellowish brown sand; light yellowish brown, mottled sand; dark yellowish brown sandy loam; and yellowish brown silty clay loam. The substratum to a depth of about 60 inches is brown, mottled silty clay loam.

Included with these soils in mapping are small areas of the somewhat poorly drained Pipestone soils, the poorly drained Corunna soils, and the very poorly drained Brookston soils. Pipestone soils are sandy throughout. They are in landscape positions similar to those of the Capac and Wixom soils. Corunna and Brookston soils are in depressions and drainageways. Included soils make up 5 to 20 percent of the unit.

Permeability is moderately slow in the Capac soil. It is rapid in the upper part of the Wixom soil and moderately slow in the lower part. Available water capacity is high in the Capac soil and moderate in the Wixom soil. Surface runoff is medium on the Capac soil and slow on the Wixom soil. The seasonal high water table is at a depth of 1.0 to 2.0 feet from November through May in the Capac soil and at a depth of 0.5 foot to 1.5 feet from November through June in the Wixom soil. The water table also is high in extremely wet periods during the rest of the year.

Most areas of these soils are used as cropland. Some of the acreage is woodland or idle land.

These soils are moderately well suited to corn, soybeans, small grain, hay, and tree fruits, such as apples and pears. The major management concerns are wetness, water erosion, and compaction. Also, soil blowing is a concern in some areas. A subsurface drainage system can lower the water table if adequate outlets are available. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface helps to prevent excessive soil loss. Cover crops, buffer strips, vegetative barriers, and field windbreaks also help to control water erosion and soil blowing. Minimizing tillage and delaying tillage when the soil is wet help to prevent compaction and alteration of soil structure.

These soils are moderately well suited to woodland. The major management concerns are the equipment limitation and the windthrow hazard. Equipment should be used only during periods when the soil is relatively dry or frozen. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the wetness, these soils are poorly suited to building site development. They are poorly suited to septic tank absorption fields because of the wetness and the moderately slow permeability. If buildings are constructed on these soils, suitable fill material is needed to raise the site. Mounding the site with suitable material and installing a pressurized disposal system help to overcome the wetness and moderately slow permeability in septic tank absorption fields.

The land capability classification is IIw. The Michigan soil management groups are 2.5b and 4/1.5b.

22A—Martherton loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on plains and in small depressions and drainageways. Individual areas are irregular in shape and range from 4 to 150 acres in size.

Typically, the surface layer is very dark gray loam about 8 inches thick. The subsoil is about 18 inches thick. It is grayish brown and mottled. The upper part is clay loam, and the lower part is sandy clay loam. The substratum to a depth of about 60 inches is pale brown, calcareous gravelly sand. In places the soil has a silty clay loam or clay loam substratum within a depth of 40 inches.

Included with this soil in mapping are small areas of the well drained Oshtemo and poorly drained Sebewa soils. Sebewa soils are in depressions and drainageways. Oshtemo soils are on knolls and ridges. Included soils make up 5 to 10 percent of the unit.

Permeability is moderate in the upper part of the Matherton soil and rapid or very rapid in the lower part. Available water capacity is moderate. Surface runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet from November through May and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

This soil is well suited to corn, soybeans, small grain, hay, and tree fruits, such as apples, pears, and cherries. The major management concerns are wetness and compaction. Also, the soil warms up slowly in spring. A surface or subsurface drainage system can lower the water table. Minimizing tillage and delaying tillage when the soil is wet help to prevent compaction. Ridge tillage helps the soil to warm up and dry out in spring, thus allowing earlier planting and faster germination.

This soil is well suited to woodland. The major management concerns are the equipment limitation and the windthrow hazard. Equipment should be used only during periods when the soil is relatively dry or frozen. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the wetness, this soil is poorly suited to building site development. It is poorly suited to septic tank absorption fields because of the wetness and a

poor filtering capacity, which can result in the pollution of ground water supplies. Buildings should be constructed on raised, well compacted fill material. Filling or mounding the site with suitable material and installing a pressurized disposal system help to overcome the wetness and poor filtering capacity in septic tank absorption fields.

The land capability classification is IIw. The Michigan soil management group is 3/5b.

23—Sebewa loam. This nearly level, poorly drained soil is on low flats and in drainageways and depressions. It is frequently ponded. Individual areas are irregular in shape and range from 4 to 80 acres in size.

Typically, the surface layer is black loam about 10 inches thick. The subsoil is about 15 inches thick. It is mottled. The upper part is dark gray sandy loam, and the lower part is grayish brown clay loam. The upper part of the substratum is brown sand. The lower part to a depth of about 60 inches is yellowish brown sand that has bands of clay loam. In places the subsoil is clayey.

Included with this soil in mapping are small areas of the somewhat poorly drained Brady and Matherton soils. These soils are slightly higher on the landscape than the Sebewa soil. They make up 5 to 10 percent of the unit.

Permeability is moderate in the upper part of the Sebewa soil and rapid in the lower part. Available water capacity is moderate. Surface runoff is very slow or ponded. The seasonal high water table is near or above the surface from September through May and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some are used as woodland.

If drained, this soil is well suited to corn, soybeans, small grain, and hay. The major management concerns are excess water and compaction. Also, the soil warms up slowly in spring. A surface or subsurface drainage system can lower the water table. Minimizing tillage and delaying tillage when the soil is wet help to prevent compaction. Ridge tillage helps the soil to warm up and dry out in spring, thus allowing earlier planting and faster germination.

This soil is well suited to woodland. The major management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. Equipment should be used only during periods when the soil is relatively dry or frozen. Special site preparation, such as bedding before planting, reduces the seedling mortality rate in some areas. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard.

Because of the ponding, this soil is generally unsuited to building site development and septic tank absorption fields.

The land capability classification is IIw. The Michigan soil management group is 3/5c.

26A—Pipestone sand, 0 to 4 percent slopes. This nearly level and undulating, somewhat poorly drained soil is on flats and in convex areas characterized by small depressions. Individual areas are irregular in shape and range from 5 to 500 acres in size.

Typically, the surface layer is very dark grayish brown sand about 9 inches thick. The subsurface layer is pinkish gray sand about 7 inches thick. The subsoil is mottled sand about 8 inches thick. The upper part is dark reddish brown and weakly cemented, and the lower part is strong brown. The upper part of the substratum is yellowish brown sand. The lower part to a depth of about 60 inches is grayish brown loamy sand. In places the subsoil does not have a strong brown layer. In some areas the substratum has bands of loamy fine sand. In other areas it is silty clay loam or clay loam.

Included with this soil in mapping are small areas of the poorly drained Granby, somewhat poorly drained Morocco, and moderately well drained Oakville soils. Granby soils are in depressions and drainageways. Morocco soils are more acid than the Pipestone soil. They are in landscape positions similar to those of the Pipestone soil. Oakville soils are on low ridges and knolls. Included soils make up 10 to 15 percent of the unit.

Permeability is rapid in the Pipestone soil. Available water capacity is low. Surface runoff is slow or very slow. The seasonal high water table is at a depth of 0.5 to 1.5 feet from October through June and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

This soil is poorly suited to crops, but corn, small grain, and hay can be grown. The soil is moderately well suited to specialty crops, such as blueberries. The major management concerns are wetness and soil blowing. A surface or subsurface drainage system can lower the water table. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface helps to prevent excessive soil loss. Cover crops, vegetative barriers, buffer strips, and field windbreaks also help to control soil blowing.

This soil is well suited to woodland. The major management concerns are the equipment limitation and the windthrow hazard. Equipment should be used only during periods when the soil is relatively dry or frozen. Carefully selecting sites for logging roads and using wide-tracked equipment help to overcome the equipment limitation caused by the deep sand. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the wetness, this soil is poorly suited to building site development. Subsurface drains help to lower the water table. The buildings should be constructed on raised, well compacted fill material. The soil is poorly suited to septic tank absorption fields because of the wetness and a poor filtering capacity,

which can result in the pollution of ground water supplies. Special construction methods, such as filling or mounding the site with suitable material, and a pressurized disposal system help to overcome these limitations.

The land capability classification is IVw. The Michigan soil management group is 5b.

27B—Metea loamy fine sand, 1 to 6 percent slopes. This nearly level and undulating, well drained soil is on slightly convex ridges, knolls, and side slopes. Individual areas are irregular in shape and range from 5 to 300 acres in size.

Typically, the surface layer is very dark grayish brown loamy fine sand about 12 inches thick. The subsoil is about 29 inches thick. It is yellowish brown. The upper part is loamy fine sand and sandy loam, and the lower part is clay loam. The substratum to a depth of about 60 inches is brown clay loam. In some areas the soil has a sandy substratum below a depth of 40 inches and has bands of loamy fine sand in the subsoil.

Included with this soil in mapping are small areas of the somewhat poorly drained Rimer and well drained Marlette soils. Rimer soils are in small drainageways and depressions. Marlette soils are not sandy in the upper part. They are in landscape positions similar to those of the Metea soil. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the upper part of the Metea soil and moderately slow in the lower part. Available water capacity is moderate. Surface runoff is slow.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

This soil is moderately well suited to corn, soybeans, small grain, hay, and specialty crops, such as potatoes, asparagus, and fruit trees. The major management concerns are soil blowing and droughtiness. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface helps to prevent excessive soil loss. Cover crops, vegetative barriers, buffer strips, and field windbreaks also help to control soil blowing. Returning crop residue to the soil, planting green manure crops, and regularly adding other organic material improve fertility and the available water capacity. Irrigation is needed during the drier summer months. Because of the limited amount of available water, corn and small grain should be planted early in spring or fall-seeded crops, such as rye or winter wheat, should be grown.

This soil is well suited to woodland. The major management concern is seedling mortality. Special site preparation, such as furrowing or applying herbicides before planting, and selection of planting stock that is more than 2 years old or is containerized increase the seedling survival rate.

This soil is well suited to building site development. It is only moderately well suited to septic tank absorption fields because of the moderately slow permeability in the lower part of the profile. Enlarging the absorption field or installing a pressurized disposal system or alternating drain fields helps to overcome this limitation.

The land capability classification is IIIe. The Michigan soil management group is 4/2a.

27C—Metea loamy fine sand, 6 to 12 percent slopes. This gently rolling, well drained soil is on knolls, ridges, and side slopes. Individual areas are irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is very dark grayish brown loamy fine sand about 9 inches thick. The subsoil is about 32 inches thick. It is yellowish brown. The upper part is loamy fine sand and sandy loam, and the lower part is clay loam. In some areas the soil has a sandy substratum below a depth of 40 inches and has bands of loamy fine sand in the subsoil.

Included with this soil in mapping are small areas of the somewhat poorly drained Rimer and well drained Marlette soils. Rimer soils are in small drainageways and depressions. Marlette soils are not sandy in the upper part. They are in landscape positions similar to those of the Metea soil. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the upper part of the Metea soil and moderately slow in the lower part. Available water capacity is moderate. Surface runoff is slow.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

This soil is moderately well suited to corn, soybeans, small grain, hay, and specialty crops, such as fruit trees. The major management concerns are water erosion, soil blowing, and droughtiness. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, grassed waterways, vegetative barriers, and field windbreaks help to prevent excessive water erosion and soil blowing. A cropping system dominated by small grain, hay, and cover crops also helps to control erosion. Because of the limited amount of available water, small grain should be planted early in spring or fall-seeded crops, such as rye or winter wheat, should be grown. Returning crop residue to the soil, growing green manure crops, or regularly adding other organic material improves fertility and the available water capacity.

This soil is well suited to woodland. The major management concern is seedling mortality. Special site preparation, such as furrowing on the contour or applying herbicides before planting, and selection of planting stock that is more than 2 years old or is containerized increase the seedling survival rate.

Because of the slope, this soil is only moderately well suited to building site development. It is poorly suited to septic tank absorption fields because of the slope and the moderately slow permeability in the lower part of the profile. Buildings should be designed so that they

conform to the natural slope of the land. Land shaping is necessary in some areas. Land shaping and installing the distribution lines across the slope help to ensure that septic tank absorption fields function properly. Enlarging the absorption field or installing a pressurized disposal system or alternating drain fields helps to overcome the moderately slow permeability.

The land capability classification is IIIe. The Michigan soil management group is 4/2a.

28A—Rimer loamy sand, 0 to 4 percent slopes. This nearly level and undulating, somewhat poorly drained soil is on slightly convex ridges, knolls, and short side slopes. Individual areas are irregular in shape and range from 5 to 120 acres in size.

Typically, the surface layer is dark brown loamy sand about 11 inches thick. The subsoil is about 25 inches thick. It is mottled. The upper part is yellowish brown loamy sand, the next part is dark yellowish brown and dark brown sandy loam, and the lower part is brown silty clay loam. The substratum to a depth of about 60 inches is brown, mottled silty clay loam. In some areas the soil has a finer textured substratum. In other areas the sandy upper layers are more than 40 inches thick.

Included with this soil in mapping are small areas of the somewhat poorly drained Capac, poorly drained Belleville, moderately well drained Seward, and well drained Metea soils. Capac soils are finer textured than the Rimer soil. They are in landscape positions similar to those of the Rimer soil. Seward soils are in the slightly higher landscape positions. Metea soils are on knolls and ridges. Belleville soils are in drainageways and shallow depressions. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the upper part of the Rimer soil and very slow in the lower part. Available water capacity is moderate. Surface runoff is very slow. The seasonal high water table is at a depth of 1.0 to 2.5 feet from November through April and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

This soil is well suited to corn, soybeans, small grain, hay, and specialty crops, such as potatoes, asparagus, blueberries, and fruit trees. The major management concerns are wetness and soil blowing. A surface or subsurface drainage system can lower the water table. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface helps to prevent excessive soil loss. Cover crops, buffer strips, vegetative barriers, and field windbreaks also help to control soil blowing.

This soil is well suited to woodland. The major management concern is the equipment limitation. Equipment should be used only during the periods when the soil is relatively dry or frozen.

Because of the wetness, this soil is poorly suited to building site development. It is generally unsuited to septic tank absorption fields because of the wetness and the very slow permeability.

The land capability classification is IIe. The Michigan soil management group is 4/1b.

29—Cohoctah silt loam. This nearly level, poorly drained soil is in narrow to broad, elongated areas on flood plains along rivers and streams. It is frequently flooded. Individual areas range from 5 to 200 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 12 inches thick. The substratum to a depth of about 60 inches is mottled. It is dark gray loam in the upper part and gray sandy loam and sand in the lower part. In places the substratum has bands of silty clay loam and clay loam.

Included with this soil in mapping are small areas of the very poorly drained Sloan and poorly drained Glendora soils on flood plains. Sloan soils are finer textured and Glendora soils coarser textured than the Cohoctah soil. Also included, on the flood plains along the Kalamazoo and Rabbit Rivers, are areas where escarpments commonly adjoin the uplands. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately rapid in the Cohoctah soil. Available water capacity is moderate. Surface runoff is very slow or ponded. The seasonal high water table is at or near the surface from September through May and in extremely wet periods during the rest of the year.

Most of the acreage is idle land or woodland. Some areas are used as cropland. Because of the frequent flooding and the wetness, this soil is generally unsuited to cropland. It is moderately well suited to woodland. The major management concerns in the wooded areas are the equipment limitation, seedling mortality, and the windthrow hazard. Equipment should be used only during periods when the soil is relatively dry or frozen. Special site preparation, such as bedding, can increase the seedling survival rate in some areas. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard.

This soil is generally unsuited to building site development and septic tank absorption fields because of the wetness and the flooding.

The land capability classification is Vw. The Michigan soil management group is L-2c.

30—Colwood silt loam. This nearly level, poorly drained soil is on low flats and in depressions. It is frequently ponded. Individual areas are irregular in shape and range from 4 to 180 acres in size.

Typically, the surface layer is very dark gray silt loam about 12 inches thick. The subsoil is gray, mottled silt loam about 20 inches thick. The substratum to a depth of about 60 inches is gray, stratified silt loam, fine sandy

loam, fine sand, and loamy sand. In some places bands of silty clay loam and clay loam are in the substratum. In other places the soil is not stratified.

Included with this soil in mapping are small areas of the poorly drained Granby soils. These soils are in landscape positions similar to those of the Colwood soil. They are coarser textured than the Colwood soil. They make up 10 to 15 percent of the unit.

Permeability is moderate in the Colwood soil. Available water capacity is high. Surface runoff is very slow or ponded. The seasonal high water table is near or above the surface from October through May and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some are used as woodland.

If drained, this soil is well suited to corn, soybeans, small grain, and hay. The major management concerns are excess water and compaction. Also, the soil warms up slowly in spring. A surface or subsurface drainage system can lower the water table. Minimizing tillage and delaying tillage when the soil is wet help to prevent compaction. Ridge tillage helps the soil to warm up and dry out in spring, thus allowing earlier planting and faster germination.

This soil is moderately well suited to woodland. The major management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. Equipment should be used only during periods when the soil is relatively dry or frozen. Special site preparation, such as bedding, reduces the seedling mortality rate in some areas. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard.

Because of the ponding, this soil is generally unsuited to building site development and septic tank absorption fields.

The land capability classification is IIw. The Michigan soil management group is 2.5c-s.

31B—Tekenink loamy fine sand, 2 to 6 percent slopes. This undulating, well drained soil is on flats, side slopes, and knolls. Individual areas are irregular in shape and range from 4 to 600 acres in size.

Typically, the surface layer is dark brown loamy fine sand about 10 inches thick. The next 5 inches is mixed strong brown sandy loam and pale brown loamy fine sand. The subsoil to a depth of about 60 inches is brown and yellowish brown sandy loam. In places the upper part of the subsoil is loamy sand or sand.

Included with this soil in mapping are areas of the moderately well drained Marlette, well drained Oshtemo, and somewhat excessively drained Chelsea soils. These soils are in landscape positions similar to those of the Tekenink soil. Marlette soils are finer textured than the Tekenink soil. Oshtemo soils are coarser textured in the lower part of the subsoil than the Tekenink soil, and Chelsea soils are droughtier. Included soils make up 10 to 15 percent of the unit.

Permeability and available water capacity are moderate in the Tekenink soil. Surface runoff is slow.

Most areas of this soil are used as cropland. A small acreage is woodland or idle land.

This soil is well suited to small grain, soybeans, hay, and specialty crops, such as apples, peaches, cherries, potatoes, and asparagus. Water erosion and soil blowing are the major management concerns. Grassed waterways and a system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface help to control water erosion. Cover crops, vegetative barriers, crop residue management, and field windbreaks help to control soil blowing. Irrigation may be needed during the drier midsummer months.

This soil is well suited to woodland. Seedling mortality is the main management concern. Selecting planting stock that is more than 2 years old or is containerized, planting in furrows, and applying herbicides increase the seedling survival rate.

This soil is well suited to building site development and septic tank absorption fields. No major limitations affect these uses.

The land capability classification is IIe. The Michigan soil management group is 3a.

31C—Tekenink loamy fine sand, 6 to 12 percent slopes. This gently rolling, well drained soil is on side slopes, knolls, and ridges. Individual areas are irregular in shape and range from 4 to 200 acres in size.

Typically, the surface layer is dark brown loamy fine sand about 8 inches thick. The next 5 inches is mixed strong brown sandy loam and pale brown loamy fine sand. The subsoil to a depth of about 60 inches is brown and yellowish brown sandy loam. In places the upper part of the subsoil is loamy sand or sand.

Included with this soil in mapping are small areas of the somewhat excessively drained Chelsea and well drained Marlette soils. Chelsea soils are coarser textured than the Tekenink soil, and Marlette soils are finer textured. Both of the included soils are in landscape positions similar to those of the Tekenink soil. They make up 5 to 10 percent of the unit.

Permeability and available water capacity are moderate in the Tekenink soil. Surface runoff is medium.

Most areas of this soil are used as cropland. A small acreage is woodland or idle land.

This soil is moderately well suited to corn, small grain, soybeans, hay, and specialty crops, such as apples, peaches, and cherries. Water erosion and soil blowing are the major management concerns. They can be controlled by cover crops and a system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface. Grassed waterways and diversions also help to control water erosion.

This soil is well suited to woodland. Seedling mortality is the main management concern. Selecting planting

stock that is more than 2 years old or is containerized stock, planting in furrows, and applying herbicides increase the seedling survival rate.

Because of the slope, this soil is only moderately well suited to building site development and septic tank absorption fields. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas. Land shaping and installing the distribution lines across the slope help to ensure that septic tank absorption fields function properly.

The land capability classification is IIIe. The Michigan soil management group is 3a.

31D—Tekenink loamy fine sand, 12 to 18 percent slopes. This rolling, well drained soil is on side slopes, high knolls, and ridges. Individual areas are irregular in shape and range from 4 to 100 acres in size.

Typically, the surface layer is dark brown loamy fine sand about 7 inches thick. The next 5 inches is mixed strong brown sandy loam and pale brown loamy fine sand. The subsoil to a depth of about 60 inches is brown and yellowish brown sandy loam. In places the upper part of the subsoil is loamy sand or sand.

Included with this soil in mapping are small areas of the somewhat excessively drained Chelsea and well drained Marlette soils. Marlette soils are finer textured than the Tekenink soil. Both of the included soils are in landscape positions similar to those of the Tekenink soil. They make up 5 to 15 percent of the unit.

Permeability and available water capacity are moderate in the Tekenink soil. Surface runoff is rapid.

Most of the acreage of this soil is woodland or idle land. A few areas are used as cropland.

This soil is poorly suited to cropland, but corn, small grain, hay, and specialty crops, such as apples, cherries, and peaches, can be grown. Water erosion, soil blowing, and the slope are the major management concerns. Planting grasses and legumes or close growing crops, growing cover crops, and applying a system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface help to control water erosion and soil blowing. Grassed waterways and diversions also help to control erosion.

This soil is well suited to woodland. Seedling mortality is the major management concern. Selecting planting stock that is more than 2 years old or is containerized, planting in furrows, and applying herbicides increase the seedling survival rate.

Because of the slope, this soil is poorly suited to building site development and septic tank absorption fields. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Installing the distribution lines on the contour helps to ensure that septic tank absorption fields function properly.

The land capability classification is IVe. The Michigan soil management group is 3a.

31E—Tekenink loamy fine sand, 18 to 35 percent slopes. This hilly and very hilly, well drained soil is on side slopes, hills, and ridges. Individual areas are irregular in shape and range from 4 to 200 acres in size.

Typically, the surface layer is dark brown loamy fine sand about 6 inches thick. The next 5 inches is mixed strong brown sandy loam and pale brown loamy fine sand. The subsoil to a depth of about 60 inches is brown and yellowish brown sandy loam. In places the upper part of the subsoil is loamy sand or sand.

Included with this soil in mapping are small areas of the well drained Marlette and somewhat excessively drained Chelsea soils. These soils are in landscape positions similar to those of the Tekenink soil. Marlette soils are finer textured than the Tekenink soil. Included soils make up 5 to 10 percent of the unit.

Permeability and available water capacity are moderate in the Tekenink soil. Surface runoff is very rapid.

Most of the acreage is woodland or idle land. Because of the slope, this soil is generally unsuited to cropland. It is well suited to woodland. The erosion hazard, seedling mortality, and the equipment limitation are the major management concerns in the wooded areas. Because of the erosion hazard, logging roads, skid trails, and fire lanes should be carefully designed and constructed. Water bars, out-sloping road surfaces, culverts, and drop structures may be needed to remove excess water. Conventional crawler tractors and rubber-tired skidders can be operated safely on this soil, but caution is needed and the steeper slopes should be avoided. Selecting nursery stock that is more than 2 years old or is containerized and planting in furrows increase the seedling survival rate.

Because of the slope, this soil is generally unsuited to building site development and septic tank absorption fields.

The land capability classification is VIIe. The Michigan soil management group is 3a.

33A—Kibbie fine sandy loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on broad flats and in drainageways. Individual areas are irregular in shape and range from 4 to 100 acres in size.

Typically, the surface layer is very dark grayish brown fine sandy loam about 9 inches thick. The subsurface layer is pale brown, mottled loam about 3 inches thick. The subsoil is about 13 inches thick. It is mottled. The upper part is brown loam, and the lower part is yellowish brown clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled, stratified silty clay loam, very fine sandy loam, and silt loam. In places the soil is not stratified.

Included with this soil in mapping are small areas of the poorly drained Colwood soils and the somewhat poorly drained, sandy Rimer and Thetford soils. Colwood soils are in depressions and drainageways. Rimer and Thetford soils are in landscape positions similar to those of the Kibbie soil. Rimer soils are sandy in the upper part. Thetford soils are coarser textured throughout than the Kibbie soil. Included soils make up 5 to 10 percent of the unit.

Permeability is moderate in the Kibbie soil. Available water capacity is high. Surface runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet from November through May and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

This soil is well suited to corn, small grain, soybeans, hay, and specialty crops, such as apples. Wetness, soil blowing, and compaction are the major management concerns. A subsurface drainage system can lower the water table. Cover crops, a system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, buffer strips, vegetative barriers, and field windbreaks help to control soil blowing. Minimizing tillage and delaying tillage when the soil is wet help to prevent compaction and alteration of soil structure.

This soil is well suited to woodland. The equipment limitation and the windthrow hazard are the major management concerns. Equipment should be used only during periods when the soil is relatively dry or frozen. Carefully thinning the stands or not thinning them at all and using harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the wetness, this soil is poorly suited to building site development and septic tank absorption fields. Buildings should be constructed on suitable fill material, which raises the site. Mounding the site with suitable material and installing a pressurized disposal system help to overcome the wetness in septic tank absorption fields.

The land capability classification is IIw. The Michigan soil management group is 2.5b-s.

34—Aquents, sandy and loamy. These nearly level and undulating, somewhat poorly drained and poorly drained soils are in borrow areas and low areas that have been filled and leveled. Individual areas are irregular in shape and range from 4 to 80 acres in size.

Included with these soils in mapping are small areas of undisturbed soils. These included soils make up less than 15 percent of the unit.

The soil properties of the Aquents vary widely. They should be determined by onsite investigation.

Most of the acreage is idle land. Some areas do not have a plant cover. Some are used for building site development or recreational development.

The suitability of these soils for cropland, woodland, pasture, building site development, and recreational uses varies greatly. Onsite investigation is needed to determine the management needed to overcome the major hazards and limitations affecting these uses.

These soils are not assigned to interpretive groups.

36—Corunna sandy loam. This nearly level, poorly drained soil is on broad flats and in depressions and drainageways. It is frequently ponded. Individual areas are irregular in shape and range from 4 to 250 acres in size.

Typically, the surface layer is very dark grayish brown sandy loam about 11 inches thick. The subsoil is about 22 inches thick. It is mottled. The upper part is grayish brown sandy loam, and the lower part is gray loam and loamy sand. The upper part of the substratum is gray clay loam. The lower part to a depth of about 60 inches is brown loam. In places the surface layer is less than 10 inches thick.

Included with this soil in mapping are small areas of the poorly drained, sandy Belleville and Granby soils. These soils are in landscape positions similar to those of the Corunna soil. They are more susceptible to soil blowing than the Corunna soil. They make up 10 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the upper part of the Corunna soil and moderately slow in the lower part. Available water capacity is high. Surface runoff is very slow or ponded. The seasonal high water table is near or above the surface from November through May and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

If drained, this soil is well suited to corn, small grain, soybeans, and hay. Excess water is the main management concern. Also, the soil warms up slowly in spring. A surface and subsurface drainage system can lower the water table. Ridge tillage helps the soil to warm up and dry out in spring, thus allowing earlier planting and faster germination.

This soil is moderately well suited to woodland. The equipment limitation, seedling mortality, and the windthrow hazard are the major management concerns. Equipment should be used only during periods when the soil is relatively dry or frozen. Special site preparation, such as bedding, reduces the seedling mortality rate in some areas. The windthrow hazard can be reduced by carefully thinning the stands or not thinning them at all and by using harvest methods that do not isolate the remaining trees or leave them widely spaced.

Because of the ponding, this soil is generally unsuited to building site development and septic tank absorption fields.

The land capability classification is IIw. The Michigan soil management group is 3/2c.

39—Granby loamy sand. This nearly level, poorly drained soil is on broad flats, along drainageways, and in depressional areas. It is frequently ponded. Individual areas are irregularly shaped or linear and range from 4 to 300 acres in size.

Typically, the surface layer is very dark gray loamy sand about 11 inches thick. The subsoil is light brownish gray, mottled sand about 15 inches thick. The substratum to a depth of about 60 inches is brown, mottled sand. In some places as much as 12 inches of muck is on the surface. In other places the substratum has thin bands of sandy loam or loamy sand. In some areas in the western part of the county, the subsoil tends to be more acid.

Included with this soil in mapping are small areas of the poorly drained Newton and somewhat poorly drained Thetford and Tedrow soils. Newton soils are more acid than the Granby soil. They are in landscape positions similar to those of the Granby soil. Thetford and Tedrow soils are in the slightly higher areas. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Granby soil. Available water capacity is low. Surface runoff is very slow or ponded. The seasonal high water table is near or above the surface from November through June and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. A small acreage is woodland or idle land.

This soil is poorly suited to crops, but corn, small grain, soybeans, hay, and specialty crops, such as onions and potatoes, can be grown. Excess water, soil blowing, and the low available water capacity are the major management concerns. A surface and subsurface drainage system can lower the water table. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, vegetative barriers, and field windbreaks help to control soil blowing. Returning crop residue to the soil, planting green manure crops, and regularly adding other organic material improve the available water capacity.

This soil is moderately well suited to woodland. The equipment limitation, seedling mortality, and the windthrow hazard are the major management concerns. Equipment should be used only during periods when the soil is relatively dry or frozen. Special site preparation, such as bedding, reduces the seedling mortality rate in some areas. Carefully thinning the stands or not thinning them at all and selecting harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the ponding, this soil is generally unsuited to building site development and septic tank absorption fields.

The land capability classification is IVw. The Michigan soil management group is 5c.

41B—Blount silt loam, 1 to 4 percent slopes. This nearly level and undulating, somewhat poorly drained soil is on convex slopes and in drainageways and depressions. Individual areas are irregular in shape and range from 3 to 300 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is brown, dark brown, and gray, mottled silty clay loam about 24 inches thick. The substratum to a depth of about 60 inches is gray, mottled, calcareous silty clay loam. In some places the surface layer is sandy loam. In other places the substratum is clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Rimer soils, the moderately well drained Glynwood and Seward soils, and the poorly drained Pewamo soils. Rimer soils are coarse textured in the upper part. They are in landscape positions similar to those of the Blount soil. Glynwood and Seward soils are on the higher knolls and ridges. Pewamo soils are in shallow depressions and drainageways. Included soils make up 5 to 15 percent of the unit.

Permeability is slow or moderately slow in the Blount soil. Available water capacity is high. Surface runoff is medium or slow. The seasonal high water table is at a depth of 1 to 3 feet from November through May and in extremely wet periods during the rest of the year. The soil tends to crust or puddle after heavy rains, especially in areas where the plow layer contains subsoil material.

Most areas are used as cropland. Some of the acreage is idle land. This soil is well suited to corn, soybeans, small grain, and specialty crops, such as apples and pears. The major management concerns are erosion, wetness, poor tilth, and compaction. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, cover crops, and grassed waterways help to prevent excessive soil loss. A combination of surface and subsurface drains reduces the wetness. Returning crop residue to the soil or regularly adding other organic material helps to prevent crusting, increases the rate of water infiltration, and improves tilth. Minimizing tillage and delaying tillage when the soil is wet help to prevent compaction.

This soil is moderately well suited to woodland. The major management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. Because the soil is sticky when wet, equipment should be used only during periods when the soil is relatively dry or frozen. Special site preparation, such as bedding, reduces the seedling mortality rate in some areas.

Carefully thinning the stands or not thinning them at all reduces the windthrow hazard.

Because of the wetness, this soil is poorly suited to building site development. It is poorly suited to septic tank absorption fields because of the wetness and the slow or moderately slow permeability. If buildings are constructed on this soil, suitable fill material is needed to raise the site. Mounding the site with suitable material and installing a pressurized disposal system help to overcome the wetness and restricted permeability in septic tank absorption fields.

The land capability classification is IIe. The Michigan soil management group is 1.5b.

42B—Metamora sandy loam, 1 to 4 percent slopes. This nearly level and undulating, somewhat poorly drained soil is on slightly convex plains. Individual areas are irregular in shape and range from 4 to 200 acres in size.

Typically, the surface layer is very dark grayish brown sandy loam about 9 inches thick. The subsurface layer is brown, mottled sandy loam about 6 inches thick. The subsoil is about 13 inches thick. It is mottled. The upper part is grayish brown loamy sand, the next part is dark grayish brown loam, and the lower part is gray clay loam. The substratum to a depth of about 60 inches is dark grayish brown and brown loam.

Included with this soil in mapping are areas of the somewhat poorly drained Rimer and poorly drained Corunna soils. Rimer soils are coarser textured than the Metamora soil. They are in landscape positions similar to those of the Metamora soil. Corunna soils are in depressions and drainageways. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately rapid in the upper part of the Metamora soil and moderately slow in the lower part. Available water capacity is moderate. Surface runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet from November through May and in extremely wet periods during the rest of the year.

Most areas are used as cropland. This soil is well suited to corn, small grain, soybeans, hay, and specialty crops, such as fruit trees. The major management concerns are water erosion, soil blowing, and wetness. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, green manure crops, and regular additions of organic material help to control water erosion and soil blowing. A subsurface drainage system can lower the water table.

The soil is moderately well suited to woodland. The equipment limitation and the windthrow hazard are the major management concerns. Equipment should be used only during periods when the soil is relatively dry or frozen. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the wetness, this soil is poorly suited to building site development. It is poorly suited to septic tank absorption fields because of the wetness and the moderately slow permeability. Buildings can be constructed on well compacted fill material, which raises the site. A surface or subsurface drainage system helps to lower the water table. Filling or mounding the site with suitable material and installing a pressurized disposal system help to overcome the wetness and moderately slow permeability in septic tank absorption fields.

The land capability classification is IIe. The Michigan soil management group is 3/2b.

44B—Chelsea loamy fine sand, 0 to 6 percent slopes. This nearly level and undulating, somewhat excessively drained soil is on intricately intermingled low ridges, knolls, and flats. Individual areas are irregular in shape and range from 10 to 1,200 acres in size.

Typically, very dark brown leaf litter about 1 inch thick is at the surface. The surface layer is very dark brown loamy fine sand about 4 inches thick. The subsurface layer is dark yellowish brown fine sand about 25 inches thick. Below this to a depth of about 60 inches is brownish yellow fine sand that has thin bands of strong brown loamy fine sand. In some places the bands below the subsurface layer are loamy sand and sandy loam and total more than 6 inches thick. In other places the soil has no bands.

Included with this soil in mapping are small areas of the well drained Metea and Oshtemo soils. These soils are in landscape positions similar to those of the Chelsea soil. They are less droughty than the Chelsea soil. They make up 10 to 15 percent of the unit.

Permeability is rapid in the Chelsea soil. Available water capacity is low. Surface runoff is slow.

Most areas of this soil are used as cropland. Many are used as woodland.

This soil is poorly suited to cropland, but corn, small grain, soybeans, hay, and specialty crops, such as peaches, cherries, potatoes, and asparagus, can be grown. Droughtiness and soil blowing are the major management concerns. They can be controlled by field windbreaks, a system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, green manure crops, cover crops, vegetative barriers, or a combination of these. Irrigation may be needed during the drier midsummer months.

This soil is well suited to woodland. Seedling mortality is the major management concern. Selecting planting stock that is more than 2 years old or is containerized and planting in furrows increase the seedling survival rate.

This soil is well suited to building site development and moderately well suited to septic tank absorption fields. It readily absorbs but does not adequately filter the effluent

from septic tanks. The poor filtering capacity may result in the pollution of the ground water supplies.

The land capability classification is IVs. The Michigan soil management group is 5a.

44C—Chelsea loamy fine sand, 6 to 12 percent slopes. This gently rolling, somewhat excessively drained soil is on intricately intermingled ridges and knolls. Individual areas are irregular in shape and range from 4 to 250 acres in size.

Typically, very dark brown leaf litter about 1 inch thick is at the surface. The surface layer is very dark brown loamy fine sand about 4 inches thick. The subsurface layer is dark yellowish brown fine sand about 25 inches thick. Below this to a depth of about 60 inches is brownish yellow fine sand that has thin bands of strong brown loamy fine sand. In some places the bands below the subsurface layer are loamy sand and sandy loam and total more than 6 inches thick. In other places the soil has no bands.

Included with this soil in mapping are small areas of the well drained Oshtemo soils. These soils are in landscape positions similar to those of the Chelsea soil. They are less droughty than the Chelsea soil. They make up 5 to 10 percent of the unit.

Permeability is rapid in the Chelsea soil. Available water capacity is low. Surface runoff is medium.

Most areas are used as woodland. Much of the acreage is cropland or idle land. Because of droughtiness and the hazards of water erosion and soil blowing, this soil is generally unsuited to cropland. It is well suited to woodland. Seedling mortality is the major management concern in the wooded areas. Selecting nursery stock that is more than 2 years old or is containerized, planting in furrows, and applying herbicides increase the seedling survival rate.

This soil is moderately well suited to building site development and septic tank absorption fields. The slope is a limitation. Also, a poor filtering capacity is a limitation on sites for septic tank absorption fields. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas. Land shaping and installing the distribution lines across the slope help to ensure that septic tank absorption fields function properly. The poor filtering capacity may result in the pollution of ground water supplies.

The land capability classification is VIs. The Michigan soil management group is 5a.

44D—Chelsea loamy fine sand, 12 to 18 percent slopes. This rolling, somewhat excessively drained soil is on intricately intermingled ridges, high knolls, and side slopes. Individual areas are irregular in shape and range from 4 to 200 acres in size.

Typically, very dark brown leaf litter about 1 inch thick is at the surface. The surface layer is very dark brown loamy fine sand about 3 inches thick. The subsurface layer is dark yellowish brown fine sand about 25 inches thick. Below this to a depth of about 60 inches is brownish yellow fine sand that has thin bands of strong brown loamy fine sand. In some places the bands below the subsurface layer are loamy sand and sandy loam and total more than 6 inches thick. In other places the soil has no bands.

Included with this soil in mapping are small areas of the well drained Oshtemo and somewhat poorly drained Tedrow soils. Oshtemo soils are in landscape positions similar to those of the Chelsea soil. They are less droughty than the Chelsea soil. Tedrow soils are in small drainageways and depressions. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Chelsea soil. Available water capacity is low. Surface runoff is medium.

Most areas of the acreage is woodland or idle land. Because of the slope and droughtiness, this soil is generally unsuited to cropland. It is well suited to woodland. Seedling mortality is the major management concern in the wooded areas. Selecting nursery stock that is more than 2 years old or is containerized, planting in furrows, and applying herbicides increase the seedling survival rate.

This soil is poorly suited to building site development and septic tank absorption fields. The slope is a limitation. Also, a poor filtering capacity is a limitation on sites for septic tank absorption fields. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Land shaping and installing the distribution lines across the slope help to ensure that septic tank absorption fields function properly. The poor filtering capacity may result in the pollution of ground water supplies.

The land capability classification is VIIs. The Michigan soil management group is 5a.

44E—Chelsea loamy fine sand, 18 to 30 percent slopes. This hilly and very hilly, somewhat excessively drained soil is on intricately intermingled ridges, hills, and side slopes. Individual areas are irregularly shaped or linear and range from 4 to 200 acres in size.

Typically, very dark brown leaf litter about 1 inch thick is at the surface. The surface layer is very dark brown loamy fine sand about 3 inches thick. The subsurface layer is dark yellowish brown fine sand about 25 inches thick. Below this to a depth of about 60 inches is brownish yellow fine sand that has thin bands of strong brown loamy fine sand. In some places the bands below the subsurface layer are loamy sand and sandy loam and total more than 6 inches thick. In other places the soil has no bands.

Included with this soil in mapping are small areas of the well drained Oshtemo, somewhat poorly drained Tedrow, and poorly drained Granby soils. Oshtemo soils are less droughty than the Chelsea soil. They are in

positions on the landscape similar to those of the Chelsea soil. Tedrow and Granby soils are in small depressions and drainageways. Included soils make up as much as 15 percent of the unit.

Permeability is rapid in the Chelsea soil. Available water capacity is low. Surface runoff is rapid.

Most areas are used as woodland. Some of the acreage is idle land. Because of the slope, this soil is unsuited to cropland. It is well suited to woodland. The erosion hazard, the equipment limitation, and seedling mortality are the major management concerns in the wooded areas. Because of the erosion hazard, sites for logging roads, skid trails, and landings should be carefully selected. Caution is needed if harvesting equipment is operated on the steeper slopes. Using wide-tracked equipment helps to overcome the equipment limitation. Selecting nursery stock that is more than 2 years old or is containerized increases the seedling survival rate.

This soil is generally unsuited to building site development and septic tank absorption fields because of the slope.

The land capability classification is VIIs. The Michigan soil management group is 5a.

45—Pewamo silt loam. This nearly level, poorly drained soil is in drainageways and narrow to broad depressions. It is frequently ponded. Individual areas are irregular in shape and range from 6 to 300 acres in size.

Typically, the surface layer is very dark gray silt loam about 10 inches thick. The subsoil is gray, firm silty clay loam and silty clay about 20 inches thick. The substratum to a depth of about 60 inches is gray, calcareous silty clay loam. In places it is clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Blount and poorly drained Belleville soils. Blount soils are on slight rises and knolls. Belleville soils are coarser textured than the Pewamo soil. They are in landscape positions similar to those of the Pewamo soil. Included soils make up 5 to 12 percent of the unit.

Permeability is moderately slow or slow in the Pewamo soil. Available water capacity is high. Surface runoff is very slow or ponded. The seasonal high water table is near or above the surface from December through May and in extremely wet periods during the rest of the year.

Most areas are used as cropland. If drained, this soil is well suited to corn, small grain, soybeans, and hay. The major management concerns are excess water, poor tilth, and compaction. Also, the soil warms up slowly in spring. A surface and subsurface drainage system can remove the excess water (fig. 5). Properly managing crop residue, planting green manure crops, regularly adding other organic material, and delaying tillage when the soil is wet help to prevent compaction and increase the rate of water infiltration. Ridge tillage helps the soil to warm up and dry out in spring, thus allowing earlier planting and faster germination.

This soil is well suited to woodland. The equipment limitation, seedling mortality, and the windthrow hazard are the major management concerns. Equipment should be used only during periods when the soil is relatively dry or frozen. Special site preparation, such as bedding, reduces the seedling mortality rate in some areas. The windthrow hazard can be reduced by avoiding heavy cuttings that leave the remaining trees widely spaced.

This soil is generally unsuited to building site development and septic tank absorption fields because of the ponding.

The land capability classification is IIw. The Michigan soil management group 1.5c.

47—Napoleon muck. This nearly level, very poorly drained soil is in depressions. It is frequently ponded. Individual areas are irregularly shaped or circular and range from 8 to 600 acres in size.

Typically, the surface layer is dark reddish brown muck about 1 inch thick. The subsurface layer is black muck about 2 inches thick. The next layer is dark reddish brown mucky peat about 13 inches thick. The substratum to a depth of about 60 inches also is dark reddish brown mucky peat. In some areas the organic layers are less than 51 inches thick.

Included with this soil in mapping are small areas of the very poorly drained, mineral Newton soils. These soils are coarse textured. They make up about 5 to 10 percent of the unit.

Permeability is moderate or moderately rapid in the Napoleon soil. Available water capacity is high. Surface runoff is very slow or ponded. The seasonal high water table is near or above the surface from September through June and during extremely wet periods in July and August.

Most areas have a cover of natural vegetation, including trees. This soil is generally unsuited to cropland, but specialty crops, such as blueberries and potatoes, are grown in some drained areas.

This soil is moderately well suited to woodland. The major management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. The use of heavy equipment for planting, tending, and harvesting trees is restricted because of the wetness and low strength. Selective cutting or clearcutting in small areas allows for natural regeneration. The windthrow hazard can be reduced by avoiding heavy cuttings that leave the remaining trees widely spaced.

This soil is not suited to building site development or septic tank absorption fields because of the ponding and low strength.

The land capability classification VIw. The Michigan soil management group is Mc-a.

48—Belleville loamy sand. This nearly level, poorly drained soil is on low flats and in depressions. It is

Figure 5.—A surface drainage system in an area of Pewamo silt loam.

frequently ponded. Individual areas are irregular in shape and range from 4 to 200 acres in size.

Typically, the surface layer is black loamy sand about 13 inches thick. The subsoil is about 19 inches thick. It is mottled. The upper part is dark grayish brown loamy sand, and the lower part is grayish brown sand. The upper part of the substratum is dark gray silt loam. The lower part to a depth of about 60 inches is grayish brown loam and light brownish gray clay loam. In some depressional areas, the surface layer is mucky. In places the substratum has pockets or layers of fine sand or sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Rimer soils on slight rises and knolls. These soils make up 5 to 10 percent of the unit.

Permeability is rapid in the upper part of the Belleville soil and moderately slow in the lower part. Available water capacity is moderate. Surface runoff is very slow or ponded. The seasonal high water table is near or above the surface from November through May and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

If drained, this soil is moderately well suited to corn, small grain, soybeans, hay, and specialty crops, such as blueberries. The major management concerns are excess water and soil blowing. A surface and subsurface drainage system reduces the wetness. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, vegetative barriers, cover crops, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil, planting green manure crops, or regularly adding other organic material improves the available water capacity and increases the organic matter content.

This soil is poorly suited to woodland. The major management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. Equipment should be used only during periods when the soil is relatively dry or frozen. Special site preparation, such as bedding, reduces the seedling mortality rate in some areas. The windthrow hazard can be reduced by avoiding heavy cuttings that leave the remaining trees widely spaced.

This soil is generally unsuited to building site development and septic tank absorption fields because of the ponding.

The land capability classification is IIIw. The Michigan soil management group is 4/2c.

49A—Tedrow fine sand, 0 to 4 percent slopes. This nearly level and undulating, somewhat poorly drained soil

is on flats and in slightly convex areas, small depressions, and drainageways. Individual areas are irregular in shape and range from 4 to 200 acres in size.

Typically, the surface layer is very dark grayish brown fine sand about 10 inches thick. The subsoil is about 24 inches thick. It is mottled. The upper part is yellowish brown loamy fine sand, the next part is yellowish brown fine sand, and the lower part is brownish yellow fine sand. The substratum to a depth of about 60 inches is light yellowish brown, mottled fine sand. In some areas in the western part of the county, the subsoil tends to be more acid.

Included with this soil in mapping are small areas of the poorly drained Granby, somewhat poorly drained Morocco, and well drained Oakville soils. Granby soils are in depressions and drainageways. Morocco soils are more acid than the Tedrow soil. They are in landscape positions similar to those of the Tedrow soil. Oakville soils are on knolls and ridges. Included soils make up 4 to 15 percent of the unit.

Permeability is rapid in the Tedrow soil. Available water capacity is low. Surface runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet from December through April and in extremely wet periods during the rest of the year.

Most of the acreage is idle land or woodland. A few areas are used as cropland.

This soil is moderately well suited to corn, small grain, soybeans, hay, and specialty crops, such as blueberries and asparagus. Droughtiness is a limitation during some periods, and wetness is a limitation during other periods. Soil blowing is an additional management concern. Cover crops, a system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, vegetative barriers, buffer strips, and field windbreaks help to control droughtiness and soil blowing. A subsurface drainage system reduces the wetness.

This soil is well suited to woodland. The major management concern is the equipment limitation. Equipment should be used only during periods when the soil is relatively dry or frozen. The use of wide-tracked equipment helps to overcome the equipment limitation caused by the deep sand.

Because of the wetness, this soil is poorly suited to building site development. It is poorly suited to septic tank absorption fields because of the wetness and a poor filtering capacity, which can result in the pollution of ground water supplies. Buildings with basements should be constructed on well compacted fill material, which raises the site. A drainage system helps to lower the water table. Special construction methods, such as filling or mounding with suitable material, are needed to raise sites for septic tank absorption fields above the water table and to overcome the poor filtering capacity. A pressurized disposal system also helps to overcome these limitations.

The land capability classification is IIIs. The Michigan soil management group is 5b.

50—Aquents and Histosols, ponded. These very poorly drained, nearly level soils are in marshes and swamps. They generally are ponded most of the year (fig. 6). The Aquents formed in mineral material and the Histosols in organic material. The marshes support cattails, reeds, grasses, woody shrubs, and scattered clumps of water-tolerant trees. The swamps support trees. Individual areas are irregularly shaped or linear and range from 4 to several hundred acres in size.

Included with these soils in mapping are small areas of poorly drained and somewhat poorly drained soils, which make up less than 15 percent of the unit. Also included, on the flood plains along the Kalamazoo and Rabbit Rivers, are areas where escarpments commonly adjoin the uplands.

The Aquents and Histosols are used mainly for wetland wildlife habitat.

The land capability classification is VIIIw. No Michigan soil management group is assigned.

51A—Thetford loamy fine sand, 0 to 4 percent slopes. This somewhat poorly drained, nearly level and undulating soil is in broad depressional areas, in plane or slightly convex areas, and along drainageways. Individual areas are irregular in shape and range from 3 to 200 acres in size.

Typically, the surface layer is very dark brown loamy fine sand about 9 inches thick. The subsurface layer is light yellowish brown fine sand about 8 inches thick. The next 32 inches is pale brown fine sand that has bands of yellowish brown loamy fine sand and fine sandy loam. The substratum to a depth of about 60 inches is yellowish brown fine sand.

Included with this soil in mapping are small areas of the poorly drained Granby and somewhat poorly drained Kibbie soils. Granby soils are in the slightly lower landscape positions. Kibbie soils are finer textured than the Thetford soil. They are in landscape positions similar to those of the Thetford soil. Included soils make up about 8 to 15 percent of the unit.

Permeability is moderately rapid in the Thetford soil. Available water capacity is moderate. Surface runoff is slow or very slow. The seasonal high water table is at a depth of 1 to 2 feet from November through May and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some are used as woodland.

This soil is moderately well suited to corn, small grain, soybeans, hay, and specialty crops, such as apples, blueberries, potatoes, and asparagus. Wetness and soil blowing are the major management concerns. A subsurface drainage system reduces the wetness. Cover crops, a system of conservation tillage that does not invert the soil and leaves all or part of the crop residue

Figure 6.—An area of Aquents and Histosols, ponded.

on the surface, field windbreaks, buffer strips, and vegetative barriers conserve moisture and reduce the hazard of soil blowing.

This soil is well suited to woodland. The major management concern is the equipment limitation. Equipment should be used only during periods when the soil is relatively dry or frozen.

Because of the wetness, this soil is poorly suited to building site development. It is poorly suited to septic tank absorption fields because of the wetness and a poor filtering capacity, which can result in the pollution of ground water supplies. Buildings with basements should be constructed on well compacted fill material, which raises the site. A drainage system helps to lower the water table. Special construction methods, such as filling or mounding with suitable material, are needed to raise sites for septic tank absorption fields above the water table and to overcome the poor filtering capacity. A pressurized disposal system also helps to overcome these limitations.

The land capability classification is IIIw. The Michigan soil management group is 4b.

53B—Oakville fine sand, loamy substratum, 0 to 6 percent slopes. This nearly level and undulating, moderately well drained soil is on flats and knolls. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is dark brown loamy fine sand about 10 inches thick. The subsoil is yellowish brown and brownish yellow fine sand about 38 inches thick. The upper part of the substratum is yellowish brown fine sandy loam. The lower part to a depth of about 60 inches is light gray silty clay loam. In some areas the substratum is clayey.

Included with this soil in mapping are small areas of the well drained Oakville soils in the slightly higher positions on the landscape. These soils do not have a loamy substratum. They make up about 5 to 10 percent of the unit.

Permeability is rapid in the upper part of the Oakville soil and moderately slow in the lower part. Available water capacity is low. Surface runoff is very slow. The seasonal high water table is at a depth of 3 to 6 feet from November through April.

Most areas of this soil are used as woodland. Some are used as cropland.

This soil is moderately well suited to corn, small grain, soybeans, and hay; tree fruits, such as apples, peaches, and cherries; and specialty crops, such as potatoes and asparagus. Droughtiness and soil blowing are the major management concerns. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, cover crops, vegetative barriers, and field windbreaks help to control soil blowing. Returning crop residue to the soil, growing green manure crops, or regularly adding other organic material increases the available water capacity. Irrigation can be beneficial during the drier midsummer months.

This soil is well suited to woodland. Seedling mortality and the equipment limitation are the major management concerns. Selecting planting stock that is more than 2 years old or is containerized, planting in furrows, and applying herbicides increase the seedling survival rate. The use of wide-tracked equipment helps to overcome the equipment limitation.

This soil is well suited to building site development. It is only moderately well suited to septic tank absorption fields because of the wetness, the moderately slow permeability, and a poor filtering capacity, which can result in the pollution of ground water. Installing a drainage system and mounding or raising the site by adding suitable fill material help to overcome these limitations. A pressurized disposal system also can help to overcome these limitations.

The land capability classification is IIIs. The Michigan soil management group is 5/2a.

57A—Covert sand, 0 to 4 percent slopes. This nearly level and undulating, moderately well drained soil is on broad flats, narrow ridgetops, and low knolls. Individual areas are narrow or irregularly shaped and range from 5 to 150 acres in size.

Typically, the surface layer is black sand about 3 inches thick. The subsurface layer is pinkish gray sand about 4 inches thick. The subsoil is sand about 27 inches thick. The upper part is dark reddish brown and brown, and the lower part is strong brown and mottled. The substratum to a depth of about 60 inches is pale brown, mottled sand. In some places the upper part of the subsoil is yellowish brown. In other places the substratum is silty clay loam or clay loam.

Included with this soil in mapping are small areas of the well drained Oakville, somewhat poorly drained Pipestone, and poorly drained Granby soils. Oakville soils are on the highest parts of ridgetops and knolls. Pipestone soils are in the slightly lower areas. Granby soils are in small depressions and drainageways. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Covert soil. Available water capacity is low. Surface runoff is very slow. The seasonal high water table is a a depth of 2.0 to 3.5 feet from November through April.

Most of the acreage of this soil is woodland or idle land.

This soil is poorly suited to cropland, but small grain, hay, and specialty crops, such as blueberries, can be grown. Soil blowing and droughtiness are the major management concerns. Buffer strips, vegetative barriers, cover crops, and field windbreaks help to control soil blowing. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, green manure crops, and regular additions of other organic material increase the available water capacity.

This soil is well suited to woodland. Seedling mortality and the equipment limitation are the major management concerns. Selecting nursery stock that is more than 2 years old or is containerized, planting in furrows, and applying herbicides increase the seedling survival rate. Using wide-tracked equipment and restricting its use to periods when the soil is relatively dry or frozen help to overcome the equipment limitation.

Because of the wetness, this soil is only moderately well suited to building site development. It is poorly suited to septic tank absorption fields because of the wetness and a poor filtering capacity, which can result in the pollution of ground water supplies. A drainage system helps to lower the water table. Special construction methods, such as filling or mounding with suitable material, may be needed to raise sites for septic tank absorption fields above the water table and to overcome the poor filtering capacity. A pressurized disposal system also helps to overcome these limitations.

The land capability classification is IVs. The Michigan soil management group is 5a.

60B—Seward loamy fine sand, 1 to 6 percent slopes. This nearly level and undulating, moderately well drained soil is on slightly convex plains, knolls, and side slopes. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown loamy fine sand about 11 inches thick. The subsurface layer is brown fine sand about 8 inches thick. The subsoil is about 24 inches thick. The upper part is yellowish brown loamy fine sand, the next part is dark yellowish brown sandy loam, and the lower part is yellowish brown silty clay loam. The substratum to a depth of about 60 inches is yellowish brown silty clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Rimer and Blount soils. These soils are in small drainageways and depressions. They make up 5 to 15 percent of the unit.

Permeability is rapid in the upper part of the Seward soil and slow in the lower part. Available water capacity

is low. Surface runoff is very slow. The seasonal high water table is at a depth of 2.0 to 3.5 feet from November through April.

Most areas of this soil are used as cropland. Some of the acreage is woodland or idle land.

This soil is moderately well suited to corn, soybeans, small grain, hay, and specialty crops, such as blueberries, potatoes, asparagus, and fruit trees. The major management concerns are water erosion, soil blowing, and droughtiness. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, cover crops, buffer strips, vegetative barriers, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil, planting green manure crops, and regularly adding other organic material increase the available water capacity. Irrigation can be beneficial during the drier summer months.

This soil is well suited to woodland. Seedling mortality is the major management concern. Selecting nursery stock that is more than 2 years old or is containerized, planting in furrows, and applying herbicides increase the seedling survival rate.

This soil is moderately well suited to building site development and is generally unsuited to septic tank absorption fields. The major management concerns are the slow permeability, the shrink-swell potential, and the wetness. All sanitary facilities should be connected to municipal sewage systems. The wetness and shrink-swell potential on sites for buildings with basements can be minimized by installing a drainage system and by widening the foundation trench and then backfilling with suitable coarse textured material.

The land capability classification is IIe. The Michigan soil management group is 4/1a.

62—Sloan silt loam. This nearly level, very poorly drained soil is on flood plains. It is frequently flooded. Individual areas are irregular in shape and range from 2 to 100 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsoil is dark grayish brown, mottled clay loam about 16 inches thick. The upper part of the substratum is dark gray, mottled, calcareous clay loam. The lower part to a depth of about 60 inches is dark greenish gray, calcareous very fine sandy loam.

Included with this soil in mapping are small areas of the poorly drained Cohoctah and very poorly drained Palms soils. Cohoctah soils are coarser textured than the Sloan soil. They are in landscape positions similar to those of the Sloan soil. Palms soils have organic layers 16 to 51 inches thick. They are in small depressions and oxbows. Also included, on the flood plains along the Kalamazoo and Rabbit Rivers, are areas where escarpments commonly adjoin the uplands. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate or moderately slow in the Sloan soil. Available water capacity is high. Surface runoff is very slow or ponded. The seasonal high water table is at or near the surface from November through June and in extremely wet periods during the rest of the year.

Most of the acreage of this soil is woodland or idle land. A few areas are used as cropland.

If drained, this soil is moderately well suited to corn, small grain, soybeans, and hay. Undrained areas are generally unsuited to cropland. Excess water and flooding are the major management concerns. Surface and subsurface drains reduce the wetness. In some areas dikes help to protect the soil from floodwater.

This soil is well suited to woodland. The major management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. Equipment should be used only during periods when the soil is relatively dry or frozen. Special site preparation, such as bedding, reduces the seedling mortality rate in some areas. The windthrow hazard can be reduced by avoiding heavy cuttings that leave the remaining trees widely spaced.

Because of the wetness and the flooding, this soil is not suited to building site development or septic tank absorption fields.

The land capability classification is IIIw. The Michigan soil management group is L-2c.

63B—Riddles loam, 1 to 6 percent slopes. This nearly level and undulating, well drained soil is on broad flats. Individual areas are irregular in shape and range from 4 to 400 acres in size.

Typically, the surface layer is very dark grayish brown loam about 8 inches thick. The next 10 inches is mixed dark brown clay loam and pale brown sandy loam. The subsoil to a depth of about 70 inches is dark brown clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Capac and very poorly drained Brookston soils. Capac soils are in the slightly lower positions on the landscape. Brookston soils are in small depressions and drainageways. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Riddles soil. Available water capacity is high. Surface runoff is medium.

Most areas of this soil are used as cropland. Some are used as woodland.

This soil is well suited to corn, small grain, soybeans, hay, and specialty crops, such as apples, peaches, cherries, potatoes, and asparagus. The major management concerns are water erosion and compaction. Cover crops and a system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface help to control erosion. Returning crop residue to the soil, planting green manure crops, or regularly adding other organic

material improves tilth, helps to prevent crusting, and increases the rate of water infiltration. Minimizing tillage and delaying tillage when the soil is wet help to prevent compaction.

This soil is well suited to woodland. No major hazards or limitations affect planting or harvesting.

Because of the shrink-swell potential, this soil is only moderately well suited to building site development. It is well suited to septic tank absorption fields. Widening the foundation trench and then backfilling with suitable coarse textured material help to prevent the damage to buildings caused by shrinking and swelling.

The land capability classification is IIe. The Michigan soil management group is 2.5a.

63C—Riddles loam, 6 to 12 percent slopes. This gently rolling, well drained soil is on knolls and side slopes. Individual areas are irregular in shape and range from 4 to 300 acres in size.

Typically, the surface layer is very dark grayish brown loam about 8 inches thick. The next 10 inches is mixed dark brown clay loam and pale brown sandy loam. The subsoil to a depth of about 70 inches is dark brown clay loam. In places erosion has removed the surface layer, exposing the subsoil.

Included with this soil in mapping are small areas of the somewhat poorly drained Capac and very poorly drained Brookston soils. Capac soils are in the slightly lower landscape positions. Brookston soils are in small depressions and drainageways. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Riddles soil. Available water capacity is high. Surface runoff is medium.

Most areas of this soil are used as cropland. Some are used as woodland.

This soil is moderately well suited to corn, small grain, soybeans, hay, and specialty crops, such as fruit trees. The major management concerns are water erosion and compaction. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, cover crops, grassed waterways, and a cropping system dominated by small grain and hay help to control erosion. Returning crop residue to the soil, planting green manure crops, or regularly adding other organic material increases the organic matter content, helps to prevent crusting, and increases the rate of water infiltration. Minimizing tillage and delaying tillage when the soil is wet help to prevent compaction.

Because of the slope and the shrink-swell potential, this soil is only moderately well suited to building site development. It is only moderately well suited to septic tank absorption fields because of the slope. Buildings should be designed so that they conform to the natural slope of the land. In some areas land shaping is needed. Widening the foundation trench and then backfilling with suitable coarse textured material help to overcome the shrink-swell potential. Land shaping and installing the distribution lines across the slope help to ensure that septic tank absorption fields function properly.

The land capability classification is IIIe. The Michigan soil management group is 2.5a.

64—Belleville-Brookston complex. These nearly level soils are in broad drainageways and depressions. They are frequently ponded. The Belleville soil is poorly drained, and the Brookston soil is very poorly drained. Individual areas are irregularly shaped or linear and range from 40 to several hundred acres in size. They are 40 to 60 percent Belleville soil and 30 to 40 percent Brookston soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the Belleville soil has a surface layer of black loamy sand about 13 inches thick. The subsoil is about 19 inches thick. It is mottled. The upper part is dark grayish brown loamy sand, and the lower part is grayish brown sand. The upper part of the substratum is dark gray silt loam. The lower part to a depth of about 60 inches is grayish brown loam and light brownish gray clay loam.

Typically, the Brookston soil has a surface layer of very dark grayish brown loam about 10 inches thick. The subsoil is about 36 inches thick. It is mottled. The upper part is dark grayish brown loam, the next part is dark gray clay loam, and the lower part is dark grayish brown clay loam. The substratum to a depth of about 60 inches is gray clay loam.

Included with these soils in mapping are small areas of the somewhat poorly drained Capac soils on slight rises. These included soils make up 5 to 10 percent of the unit.

Permeability is rapid in the upper part of the Belleville soil and moderately slow in the lower part. It is moderate in the Brookston soil. Available water capacity is moderate in the Belleville soil and high in the Brookston soil. Surface runoff is very slow or ponded on both soils. The seasonal high water table is near or above the surface from November through May. The water table also is high in extremely wet periods during the rest of the year.

Most areas of these soils are used as cropland. Some are used as woodland.

These soils are moderately well suited to corn, small grain, soybeans, and hay. Excess water and compaction are the major management concerns. Also, the soils warm up slowly in spring, and soil blowing is a hazard on the Belleville soil. A drainage system can remove surface and subsurface water. Minimizing tillage and delaying tillage when the soil is wet help to prevent compaction and alteration of soil structure. Ridge tillage helps the soils to warm up and dry out in spring, thus allowing earlier planting and faster germination. Cover crops, buffer strips, vegetative barriers, and field windbreaks help to control soil blowing.

These soils are poorly suited to woodland. The major management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. Equipment should be used only during periods when the soils are relatively dry or frozen. Special site preparation, such as bedding, reduces the seedling mortality rate in some areas. The windthrow hazard can be reduced by avoiding heavy cuttings that leave the remaining trees widely spaced.

Because of the ponding, these soils are generally unsuited to building site development and septic tank absorption fields.

The land capability classification is IIIw. The Michigan soil management groups are 4/2c and 2.5c.

65—Cohoctah silt loam, protected. This nearly level, poorly drained soil is on flood plains. It is subject to ponding. It also is subject to rare flooding, but it generally is protected by channelized and dredged streams and ditches. Individual areas are irregularly shaped or linear and range from 4 to 200 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 12 inches thick. The substratum to a depth of about 60 inches is mottled. It is dark gray loam in the upper part and gray sandy loam and sand in the lower part.

Included with this soil in mapping are small areas of the poorly drained Glendora and very poorly drained Sloan and Palms soils. Glendora and Sloan soils are in landscape positions similar to those of the Cohoctah soil. Glendora soils are coarser textured and Sloan soils finer textured than the Cohoctah soil. Palms soils have organic layers 16 to 51 inches thick. They are in small depressions and oxbows. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately rapid in the Cohoctah soil. Available water capacity is moderate. Surface runoff is very slow. The seasonal high water table is near or above the surface from September though May and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some are used as woodland.

This soil is moderately well suited to corn, small grain, soybeans, hay, and specialty crops, such as potatoes. Excess water is the major management concern. Also, the soil warms up slowly in spring. A combination of surface and subsurface drains helps to remove the excess water. Ridge tillage helps the soil to warm up and dry out in spring, thus allowing earlier planting and faster germination.

This soil is moderately well suited to woodland. The major management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. Equipment should be used only during periods when the soil is relatively dry or frozen. Special site preparation, such as bedding, reduces the seedling mortality rate in some areas. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard.

Because of the ponding and the rare flooding, this soil is generally unsuited to building site development and septic tank absorption fields.

The land capability classification is IIw. The Michigan soil management group is L-2c.

66—Udipsamments, nearly level to gently sloping. These well drained or moderately well drained soils generally are in areas where sandy material on ridges or knolls has been removed for use elsewhere as fill or sand. In some areas depressions and flat swamps have been filled prior to building site development. Individual areas commonly are irregularly shaped or rectangular and range from 4 to 100 acres in size.

These soils have no topsoil-subsoil-substratum sequence because the original soil material has been either removed or covered. Permeability and available water capacity vary. Surface runoff is slow.

Some areas are suited to building site development, some have been developed into parks, and others are idle. Onsite investigation is needed to determine the suitability for specific uses.

These soils are not assigned to interpretive groupings.

67—Martisco muck. This nearly level, very poorly drained soil is in depressions and along drainageways. It is frequently ponded. Individual areas are irregularly shaped or circular and range from 4 to 150 acres in size.

Typically, the surface layer is black muck about 11 inches thick. The substratum to a depth of about 60 inches is light gray marl. In some areas the muck is more than 16 inches thick. In other areas sand underlies the marl.

Permeability is moderate or moderately rapid in the muck and slow in the substratum. Available water capacity is high. Surface runoff is very slow or ponded. The seasonal high water table is near or above the surface from October through June and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some are used as woodland.

This soil is poorly suited to cropland, but corn and specialty crops, such as asparagus, can be grown. Excess water, soil blowing, and a high pH are the major management concerns. Surface and subsurface drains help to remove the excess water. Field windbreaks, vegetative barriers, and cover crops help to control soil blowing.

This soil is poorly suited to woodland. The major concerns are the equipment limitation, seedling mortality, and the windthrow hazard. Equipment should be used only during periods when the soil is frozen. Special site preparation, such as bedding, reduces the seedling mortality rate in some areas. The windthrow hazard can be reduced by avoiding heavy cuttings that leave the

remaining trees widely spaced. Selective cutting or clearcutting in small areas allows for natural regeneration.

Because of the ponding and low strength, this soil is not suited to building site development or septic tank absorption fields.

The land capability classification is IVw. The Michigan soil management group is M/mc.

69—Newton mucky fine sand. This nearly level, very poorly drained soil is on broad flats and in depressions. It is subject to ponding. Individual areas are irregular in shape and range from 4 to 300 acres in size.

Typically, the surface layer is black mucky fine sand about 11 inches thick. The substratum to a depth of about 60 inches is dark grayish brown and pale brown fine sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Pipestone and Morocco soils. These soils are in the slightly higher areas. They make up 5 to 15 percent of the unit.

Permeability is rapid in the Newton soil. Available water capacity is low. Surface runoff is slow or ponded. The seasonal high water table is near or above the surface from November through May and in extremely wet periods during the rest of the year. The acidity of the surface layer can cause deficiencies in nitrogen, phosphorus, potassium, sulfur, calcium, and magnesium.

Most areas of this soil are used as woodland. Some of the acreage is cropland or idle land.

Unless drained, this soil is unsuited to cropland. Drainage outlets generally are not readily available. Some areas are drained. In these areas corn, small grain, soybeans, hay, and specialty crops, such as blueberries, can be grown. Excess water is a limitation during some periods, and droughtiness is a limitation during other periods. Soil blowing is an additional management concern. Surface and subsurface drains reduce the wetness. Because of the droughtiness, crops should be planted early in spring or fall-seeded crops should be grown. A system of conservation tillage that leaves crop residue on the surface conserves moisture. Crop residue management, cover crops, vegetative barriers, and field windbreaks help to control soil blowing.

This soil is moderately well suited to woodland. The major management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. Equipment should be used only during periods when the soil is relatively dry or frozen. Special site preparation, such as bedding, reduces the seedling mortality rate in some areas. The windthrow hazard can be reduced by avoiding heavy cuttings that leave the remaining trees widely spaced.

This soil is generally unsuited to building site development and septic tank absorption fields because of the ponding.

The land capability classification is Vw. The Michigan soil management group is 5c.

70A—Morocco fine sand, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on broad flats and in depressions. Individual areas are irregular in shape and range from 4 to 600 acres in size.

Typically, the surface layer is black fine sand about 3 inches thick. The subsoil is mottled fine sand about 22 inches thick. The upper part is dark brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is pale brown and light yellowish brown, mottled fine sand. In places the subsoil has a weakly cemented layer in which precipitated iron, aluminum, and organic matter have accumulated.

Included with this soil in mapping are small areas of the well drained or moderately well drained Oakville and very poorly drained Newton soils. Oakville soils are on knolls, slight rises, and small ridges. Newton soils are in small depressions and drainageways. Included soils make up about 5 to 10 percent of the unit.

Permeability is rapid in the Morocco soil. Available water capacity is low. Surface runoff is very slow. The seasonal high water table is at a depth of 1 to 2 feet from November through April and in extremely wet periods during the rest of the year. The acidity of the surface layer and subsoil can cause deficiencies in nitrogen, phosphorus, potassium, sulfur, calcium, and magnesium.

Most of the acreage of this soil is woodland or idle land. Specialty crops are grown in some areas.

This soil is poorly suited to cropland, but corn, small grain, soybeans, hay, and specialty crops, such as blueberries and asparagus, can be grown. Droughtiness is a limitation during some periods, and wetness is a limitation during other periods. Soil blowing is an additional management concern. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, cover crops, vegetative barriers, and stripcropping help to prevent excessive soil blowing. Returning crop residue to the soil, growing green manure crops, or regularly adding other organic material improves the available water capacity. A subsurface drainage system reduces the wetness.

This soil is moderately well suited to woodland. The major management concerns are the equipment limitation and the windthrow hazard. Equipment should be used only during periods when the soil is relatively dry or frozen. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the wetness, this soil is poorly suited to building site development. It is poorly suited to septic tank absorption fields because of the wetness and a poor filtering capacity, which can result in the pollution of ground water supplies. Buildings with basements should

be constructed on well compacted fill material, which raises the site. A drainage system helps to lower the water table. Special construction methods, such as filling or mounding with suitable material, are needed to raise sites for septic tank absorption fields above the water table and to overcome the poor filtering capacity. A pressurized disposal system also helps to overcome these limitations.

The land capability classification is IVs. The Michigan soil management group is 5b.

72B—Urban land-Oakville complex, 0 to 6 percent slopes. This nearly level and undulating map unit consists of Urban land and a well drained Oakville soil on broad flats and side slopes. Individual areas range from 10 to 300 acres in size. They are 50 to 85 percent Urban land and 10 to 45 percent Oakville soil. The Urban land and Oakville soil occur as areas so intricately mixed or so small that mapping them separately is not practical.

The Urban land is covered by streets, parking lots, buildings, and other structures.

Typically, the Oakville soil has a surface layer of dark brown fine sand about 9 inches thick. The subsoil is yellowish brown fine sand about 15 inches thick. The substratum to a depth of about 60 inches is brownish yellow fine sand. In places it has thin bands of loamy fine sand.

Included with this unit in mapping are areas of the somewhat poorly drained Tedrow soils in the lower positions on the landscape. These soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Oakville soil. Available water capacity is low. Surface runoff is very slow.

The Oakville soil is used for parks, open areas, lawns, and gardens. It is suited to lawns, gardens, parks, and playgrounds, but it is droughty and susceptible to soil blowing. Deep-rooted species should be selected for planting. Adding peat or topsoil can increase the content of organic material and the available water capacity. The soil is suited to ornamental trees and shrubs. Perennial species that can tolerate dry conditions in the summer should be selected for planting.

The Oakville soil is well suited to building site development. All sanitary facilities should be connected to municipal sewerage systems.

This unit is not assigned to interpretive groupings.

73A—Algansee loamy sand, protected, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is in drainageways and on flood plains. It is subject to rare flooding, but it generally is protected by channelized and dredged streams and ditches. Individual areas are irregularly shaped or linear and range from 4 to 200 acres in size.

Typically, the surface layer is black loamy sand about 9 inches thick. The substratum to a depth of about 60 inches is multicolored sand.

Included with this soil in mapping are small areas of the somewhat excessively drained Chelsea, well drained Oakville, and poorly drained Glendora soils. Chelsea and Oakville soils are on small ridges and knolls. Glendora soils are in depressions. Also included are unprotected areas that are more frequently flooded and some areas where sandy clay loam or clay loam bands are in the substratum. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Algansee soil. Available water capacity is low. Surface runoff is very slow. The seasonal high water table is at a depth of 1 to 2 feet from November through May and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some are used as woodland.

This soil is moderately well suited to corn, small grain, soybeans, hay, and specialty crops, such as potatoes. Wetness, soil blowing, and organic matter content are the major management concerns. Surface and subsurface drainage systems help to remove excess water. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, vegetative barriers, and field windbreaks help to control soil blowing. Returning crop residue to the soil, growing green manure crops, and regularly adding organic material increase the organic matter content and improve the available water capacity.

This soil is moderately well suited to woodland. The major management concerns are the equipment limitation and the windthrow hazard. Equipment should be used only during periods when the soil is relatively dry or frozen. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the wetness and the rare flooding, this soil is generally unsuited to building site development and septic tank absorption fields.

The land capability classification is IIIw. The Michigan soil management group is L-4c.

74—Glendora loamy sand, protected. This nearly level, poorly drained soil is on flood plains. It is subject to ponding. It also is subject to rare flooding, but it generally is protected by channelized and dredged streams and ditches. Individual areas are irregularly shaped or linear and range from 4 to 200 acres in size.

Typically, the surface layer is black loamy sand about 10 inches thick. The substratum to a depth of about 60 inches is multicolored fine sand and sand. In some places the soil does not irregularly decrease in organic matter content with increasing depth. In other places the substratum has thin bands of sandy loam and clay loam.

Included with this soil in mapping are small areas of the moderately well drained Oakville and somewhat poorly drained Algansee soils. Oakville soils are on slight ridges and knolls. Algansee soils are in the slightly higher positions on the landscape. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Glendora soil. Available water capacity is low. Surface runoff is very slow. The seasonal high water table is near or above the surface from November through May and in extremely wet periods during the rest of the year.

Most areas of this soil are used as cropland. Some are used as woodland.

This soil is moderately well suited to corn, small grain, soybeans, hay, and specialty crops, such as potatoes. Excess water, soil blowing, and organic matter content are the major management concerns. A combination of surface and subsurface drains helps to remove the excess water. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface, buffer strips, vegetative barriers, and field windbreaks help to control soil blowing. Returning crop residue to the soil, growing green manure crops, and regularly adding organic material increase the organic matter content and improve the available water capacity.

This soil is moderately well suited to woodland. The major management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. Equipment should be used only during periods when the soil is relatively dry or frozen. Special site preparation, such as bedding, reduces the seedling mortality rate in some areas. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard.

Because of the ponding and the rare flooding, this soil is generally unsuited to building site development and septic tank absorption fields.

The land capability classification is IIIw. The Michigan soil management group is L-4c.

75B—Marlette-Capac loams, 1 to 6 percent slopes. These soils are nearly level and undulating. The moderately well drained Marlette soil is on slightly convex plains and knolls. The somewhat poorly drained Capac soil is in drainageways and depressions. Individual areas are irregular in shape and range from 4 to 200 acres in size. They are 50 to 60 percent Marlette soil and 30 to 40 percent Capac soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the Marlette soil has a surface layer of brown loam about 10 inches thick. The next 14 inches is mixed brown clay loam and pale brown loam. The subsoil is brown clay loam about 14 inches thick. The substratum to a depth of about 60 inches is brown loam and dark brown clay loam. In some places the depth to the substratum is more than 50 inches. In other places the upper part of the subsoil has gray mottles.

Typically, the Capac soil has a surface layer of dark grayish brown loam about 9 inches thick. The next 4 inches is a mixture of strong brown, mottled clay loam and light brownish gray sandy loam. The subsoil is yellowish brown, mottled clay loam about 14 inches thick. The substratum to a depth of about 60 inches is brown and yellowish brown, mottled clay loam and loam.

Included with these soils in mapping are small areas of the well drained Metea, somewhat poorly drained Metamora, and very poorly drained Brookston soils. Metea and Metamora soils are coarser textured than the Marlette and Capac soils. Metea soils are in landscape positions similar to those of the Marlette soil. Metamora soils are in landscape positions similar to those of the Capac soil. Brookston soils are in depressions and drainageways. Included soils make up about 10 to 15 percent of the unit.

Permeability is moderately slow in the Marlette and Capac soils. Available water capacity is high. Surface runoff is medium. The seasonal high water table is at a depth of 2.5 to 6.0 feet from December through April in the Marlette soil and is at a depth of 1.0 to 2.0 feet from November through May in the Capac soil. The water table also is high in extremely wet periods during the rest of the year.

Most areas of these soils are used as cropland. Some of the acreage is woodland or idle land.

These soils are well suited to corn, soybeans, small grain, hay, and specialty crops, such as potatoes, asparagus, and most types of fruit trees. The major management concerns are water erosion, wetness, and compaction. A system of conservation tillage that does not invert the soil and leaves all or part of the crop residue on the surface helps to control erosion. A subsurface drainage system reduces the wetness. Minimizing tillage and delaying tillage when the soils are wet help to prevent compaction and alteration of soil structure.

These soils are well suited to woodland. The major management concerns are the equipment limitation and the windthrow hazard. Equipment should be used only during periods when the soils are relatively dry or frozen. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

The Marlette soil is moderately well suited and the Capac soil poorly suited to building site development and septic tank absorption fields. The wetness is a limitation. Also, the moderately slow permeability is a limitation on sites for septic tank absorption fields. Buildings can be constructed on well compacted fill material, which raises the site. Subsurface drains help to lower the water table. Special construction methods, such as filling or mounding with suitable material, may be needed to overcome the wetness and moderately slow permeability

on sites for septic tank absorption fields. A pressurized disposal system also helps to overcome these limitations.

The land capability classification is IIe. The Michigan soil management groups are 2.5a and 2.5b.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban and built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Soils that have limitations, such as a seasonal high water table, frequent flooding during the growing season, or inadequate rainfall, qualify for prime farmland only in areas where these limitations have been overcome by such measures as drainage, flood control, or irrigation. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

Unique Farmland

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops. Examples of such crops are vegetables and tree, vine, and berry fruits. The soil qualities, landscape position, growing season, and moisture supply are those needed for a well managed soil to produce sustained high yields of these crops in an economic manner.

The unique farmland in Allegan County occurs as large, drained areas of the organic Houghton, Adrian, Palms, and Martisco soils used for vegetables; the gently rolling and rolling, loamy or sandy Oakville, Ockley, Oshtemo, Chelsea, and Riddles soils used for tree and vine fruits; and the acid, sandy Morocco, Newton, and Pipestone soils used for blueberries. Yields for these unique soils are listed in table 7. Although these soils are not considered prime farmland, the unique quality of this land and its value to the local economy should be considered when land use decisions are made.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties (*10*).

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where wetness or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Thaddeus Piwowar, district conservationist, and Jerry Grigar, agronomist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

In 1974, about 265,134 acres in Allegan County, or 50 percent of the total acreage, was farmland (*15*). About 200,834 acres was cropland of all kinds. About 31,710 acres was farm woodlots or wooded pasture, and 36,995 acres was other kinds of farmland.

The main management needs in the areas of the county used for crops and pasture are measures that help to control water erosion and soil blowing, reduce wetness, and improve fertility and tilth.

Water erosion and *soil blowing* are major management concerns on most of the cropland in the county. Water erosion is a hazard on soils that have a slope of more than 2 percent. Examples are Marlette and Oshtemo soils, which have a slope of as much as 35 percent.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, such as Glynwood soils, and on soils that tend to be droughty, such as Chelsea and Oakville soils. Second, erosion on farmland results in the sedimentation of streams. Controlling erosion minimizes this pollution and improves the quality of water for municipal and recreation uses and for fish and other wildlife.

On loamy and clayey spots in many of the more sloping areas, preparing a good seedbed and tilling are difficult because the friable surface layer has been eroded away. These spots are common in areas of Glynwood, Marlette, Metea, and Ockley soils on knolls and ridges.

Erosion-control practices provide a protective cover, reduce the runoff rate, and increase the rate of water infiltration. A cropping system that keeps a plant cover on the surface for extended periods reduces the susceptibility to erosion and preserves the productive capacity of the soil. On livestock farms, where pasture and hay are needed, including forage crops of grasses and legumes in the cropping sequence helps to control

erosion, provides nitrogen for subsequent row crops, and improves tilth.

Soil blowing is a hazard on the sandy Chelsea, Granby, Oshtemo, and Pipestone soils and on the mucky Houghton soils. It can damage these soils in a few hours if the wind is strong, the soils are dry, and the surface is bare. An adequate plant cover, wind stripcropping, vegetative barriers, field windbreaks, buffer strips, cover crops, and conservation tillage help to control soil blowing.

Slopes are so short or irregular that contour farming, contour stripcropping, and terracing are not practical in most areas of the more sloping Chelsea, Glynwood, Marlette, Oakville, Ockley, Oshtemo, and Tekenink soils. On these soils, a cropping system that provides a substantial vegetative cover is needed to control erosion unless a system of conservation tillage is applied.

The principal types of conservation tillage in the county are mulch-till, ridge-till, and no-till. Mulch-till is a system in which the surface is disturbed by tillage prior to planting. Tillage tools, such as chisels, field cultivators, disks, sweeps, blades, or rotators, are used. At least 30 percent of the surface remains covered by crop residue. Weeds are controlled by a combination of herbicides and cultivation.

No-till is the best means of controlling both soil blowing and water erosion. It is a system in which the surface is not disturbed prior to planting. The crop is planted in a seedbed approximately 1 to 3 inches wide. The seedbed is prepared by special coulters mounted on the planter. Weeds are controlled primarily by herbicides. No-till is effective in controlling erosion in the more sloping areas used for corn or soybeans. It can be adapted to most of the soils in the county. It is less effective, however, on soils that have a mucky or clayey surface layer. When this system is applied, crop residue is left on the surface throughout the year. In areas where no-till crops are grown, different methods of planting and of controlling weeds and insects are needed. The proper time for planting, the selection of herbicides that are suited to the existing vegetation, control of insects, an adequate supply of plant nutrients, and the selection of tillage systems based on soil characteristics are important management requirements.

Ridge-till is suited to medium textured to fine textured, somewhat poorly drained and poorly drained soils that have a slope of less than 3 percent. The surface is not disturbed prior to planting. Approximately one-third of the surface is tilled with sweeps or row cleaners at planting time. The crop is planted on ridges that generally are 4 to 6 inches higher than the areas between the rows. Weeds are controlled by a combination of herbicides and cultivation. Cultivation is used to rebuild the ridges.

Information about the design of erosion-control practices for each kind of soil is available in local offices of the Soil Conservation Service.

Soil drainage is a major management concern in about half the areas of the county used for crops and pasture. Drainage of cropland improves the air-water relationship in the root zone. In areas where drainage is poor, spring planting, spraying, and harvesting are delayed and controlling weeds is difficult. Properly designed tile lines or surface drainage systems, or both, can be used to remove excess water.

Some soils are naturally so wet that they cannot be used for the crops commonly grown in the county. These soils generally cannot be drained because no outlets are available. Examples of these soils are the very poorly drained Newton, Brookston, and Houghton soils and the poorly drained Glendora soils.

Natural drainage is good in Glynwood, Marlette, and Ockley soils most of the year, but these soils tend to dry slowly after rains. Small areas of the wetter soils along drainageways and in swales are commonly included in some areas of these soils. Artificial drainage is needed in many of these areas.

The design of surface and subsurface drainage systems varies with the kind of soil. Tile drainage is needed in most areas of the somewhat poorly drained and poorly drained soils that are used for crops. The drains should be more closely spaced in the more slowly permeable soils, such as Blount, Capac, and Pewamo soils. Diversions can be used to divert runoff from some wet areas. Good tilth and an ample supply of organic matter also improve drainage. In low lying areas the growing season is shortened by frost late in spring and early in fall.

Information about the design of drainage systems for each kind of soil is available in local offices of the Soil Conservation Service.

Soil fertility is naturally medium or high in loamy soils and low in most sandy soils on uplands. Soils on flood plains, such as Cohoctah, Glendora, and Sloan soils, range from medium acid to mildly alkaline and are naturally higher in content of plant nutrients than most soils on uplands.

Many sandy soils naturally range from extremely acid to slightly acid. Applications of lime are needed to raise the pH level sufficiently for good production of alfalfa and other crops that grow well only on nearly neutral soils. Available phosphorus and potash levels are naturally low or medium in most of these soils.

On all soils, additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields (*7*). The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime needed.

Soil tilth is an important factor affecting the germination of seeds, root development, and the infiltration of water into the soil. Soils that have good tilth are granular and porous.

Some of the soils used for crops have a loamy surface layer that is light in color and low in organic matter

content. Generally, the structure of such soils is weak, and intense rainfall causes the surface to crust. This crusting decreases the rate of water infiltration and increases the runoff rate. Regular additions of crop residue, manure, and other organic material can improve tilth and can help to prevent surface crusting.

Maintaining good tilth is difficult in the dark Pewamo soils because these soils stay wet until late in spring. If the soils are plowed when wet, they tend to be very cloddy when dry and the subsoil is compacted. As a result, preparing a good seedbed is difficult. Cover crops, green manure crops, proper management of crop residue, and applications of livestock manure help to maintain or improve tilth and the organic matter content.

Field crops suited to the soils and climate in the survey area include a few that are not commonly grown. Corn, soybeans, wheat, and oats are the commonly grown field crops. Grain sorghum, sunflowers, and similar crops can be grown if economic conditions are favorable. Rye, buckwheat, and barley are some close-grown crops that are not commonly grown but that have good potential. Grass seed can be produced from brome, fescue, red clover, redtop, and bluegrass. Alfalfa and clover grown in mixtures with grasses are the most common hay crops.

Specialty crops that are commonly grown on a commercial basis are apples, blueberries, peaches, cherries, pears, grapes, apricots, nectarines, plums, potatoes, celery, carrots, onions, cauliflower, asparagus, Christmas trees, and perennial flowers and bulbs. Large areas could be used for other specialty crops, such as strawberries and raspberries. The climate favors intensive fruit production. Temperatures and frost dates are modified by the proximity to Lake Michigan. The lake keeps temperatures low in spring and thus delays bud swelling and bloom. Because temperatures remain slightly higher in fall, early killing frosts are delayed.

Deep soils in which natural drainage is good warm up early in spring. As a result, they are especially suited to many vegetables and berry fruits. These are the Chelsea, Oakville, Oshtemo, and Tekenink soils that have a slope of less than 6 percent. Crops generally can be planted and harvested earlier on these soils than on the other soils in the county.

Most of the well drained soils in the county are suitable for orchards and nursery plants. The moderately well drained and somewhat poorly drained, finer textured soils on ridges and knolls in the western part of the county are good sites for apple, pear, and plum orchards. Soils in low areas, where frost action is frequent and air drainage is poor, generally are poorly suited to early vegetables, small fruits, and orchards.

The latest information about growing specialty crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Pasture in the county is generally in areas where erosion is a hazard or where the soils are too wet for cultivation. The key forage species include alfalfa and smooth bromegrass on medium textured, well drained soils; birdsfoot trefoil, bromegrass, and orchardgrass on wet or hilly, erodible soils; and reed canarygrass on undrained mucks.

Control of erosion is particularly important when a pasture is seeded. Mulch seeding or growing a nurse crop can help to control erosion. The need for lime and fertilizer should be determined by soil tests. Adequate amounts should be applied. Compaction caused by grazing when the soils are wet retards the growth of pasture plants. Deferred grazing during wet periods helps to prevent this compaction.

The productivity of a pasture and its ability to protect the soil are influenced by the stocking rate, the length of the grazing season, and the distribution of rainfall. Good pasture management includes stocking rates that maintain the key forage species, pasture rotation, deferred grazing when the soil is wet, timely grazing, and livestock watering facilities at strategic locations.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in tables 6 and 7. In any given year, yields may be higher or lower than those indicated in the tables because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the tables.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in tables 6 and 7 are grown in the survey area, but estimated yields are not

listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (*12*). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 8. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields tables. Also given at the end of each map unit description is a Michigan soil management group. The soils are assigned to a group according to the dominant profile texture, the natural drainage class, and the major management concerns. For soils making up a complex, the management groups are listed in the same order as the series named in the complex (*8*).

Woodland Management and Productivity

Virgin forest once covered almost all of the county. Vast pine forests covered Valley and Heath Townships, the eastern parts of Clyde and Manlius Townships, and parts of Lee, Cheshire, Trowbridge, Allegan, and Monterey Townships. Most of these areas of sandy soils currently support oak and scattered white pine. Also, many plantations of red, jack, and white pine have been established in these areas.

About 150,000 acres in Allegan County, or 28 percent of the total acreage, is woodland. Areas unsuited to agriculture, such as excessively wet areas, steep areas, or sand dunes, support a variety of forest species, mostly maple, hickory, beech, birch, ash, oak, cherry, poplar, elm, pine, and walnut. Much of this woodland could be improved by management measures, such as thinning the stands and controlling plant competition, disease, and insects. The Soil Conservation Service and the Michigan Department of Natural Resources, Division of Forestry, can help to determine specific management needs.

Table 9 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each suitable soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; and 6 to 8, high. The second part of

the symbol, a letter, indicates the major kind of soil limitation. The letter *r* indicates steep slopes; *x*, stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted rooting depth; *c*, clay in the upper part of the soil; *s*, sandy texture; and *f*, high content of coarse fragments in the soil profile. The letter *a* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: r, x, w, t, d, c, s, and f.

In table 9, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that few trees may be blown down by strong winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. It applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume,* a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced on a fully stocked, even-aged, unmanaged stand.

Trees to plant are those that are suited to the soils and to commercial wood production.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 10 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 10 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

About 150,000 acres of forest land, 97 inland lakes, and 25 miles of shoreline along Lake Michigan provide numerous opportunities for recreation in the county (*9*).

Allegan County has 208 miles of streams, 7,760 acres of inland lakes, and 47,000 acres of state-owned lands suitable for fishing, hunting, boating, camping, picnicking, hiking, swimming, snowmobiling, and cross-country skiing (fig. 7). Public lands available for recreation include the Allegan State Game Area, Saugatuck Dunes State Park, and the Lake Allegan Reservoir. Other recreation areas include five county parks, city and township parks, nine golf courses, private campgrounds, a ski resort, and 22 miles of cross-country ski trails. Marina and charter boat facilities are available in the Saugatuck area.

The soils of the survey area are rated in table 11 according to limitations that affect their suitability for

Figure 7.—An area of Oakville, Rimer, and Pipestone soils used for recreation.

recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 11, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 11 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 14 and interpretations for dwellings without basements and for local roads and streets in table 13.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The

surface is free of stones and boulders, is firm after rains, and is not dusty when dry.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Allegan County has a large and varied population of fish and wildlife (*13*). The heavily wooded state game area within the county provides important habitat for whitetail deer and wild turkey. This area also provides food and cover for various other wildlife species, such as tree squirrels, ruffed grouse, cardinals, wrens, woodpeckers, and mice. The wetlands in the county enhance several migration corridors. The species using these corridors are diving ducks, dabbling ducks, and Canada blue and snow geese. The wetlands and adjacent areas also provide habitat for herons, cranes, kingfishers, woodcocks, marsh hawks, muskrats, and mink. The farmed areas and the associated idle areas of grass and brush are inhabited by pheasants, quail, cottontail rabbits, woodchucks, red fox, opossum, hawks, owls, and songbirds. The streams and lakes provide habitat for sunfish, perch, bass, trout, northern pike, walleye, bullhead, sucker, and carp. Steelhead and salmon fishing is available in the Kalamazoo, Rabbit, Black, and Macatawa Rivers. Salmon, lake trout, and steelhead fishing is available in Lake Michigan.

In many areas of the county, the wildlife habitat can be improved. Increasing the acreage of grassland and cropland in areas where more than 50 percent of the vegetation is forest or brush cover would provide more food, cover, and living space for new and existing species. Maintaining the densely forested land in the Allegan State Game Area can protect its value as wildlife habitat.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 12, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, birdsfoot trefoil, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are milkweed, goldenrod, ragweed, burdock, dandelion, strawberry, lambsquarter, and wild carrot.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of

hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, maple, apple, hawthorn, dogwood, hickory, birch, beech, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are autumn-olive, crabapple, honeysuckle, dogwood, and American cranberrybush.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, arrowhead, duckweed, rushes, sedges, reeds, and cattails.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, deer, opossum, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, tree squirrels, woodland deer mouse, raccoon, deer, and pine mouse.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, kingfisher, muskrat, mink, turtles, frogs, and marsh hawks.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 13 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by a very firm dense layer, stone content, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, and the available water capacity in the upper 40 inches affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 14 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 14 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, and flooding affect absorption of the effluent. Large stones interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel are less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 14 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 14 are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, and soil reaction affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 15 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of

more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 15, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, and rock fragments.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are naturally fertile or respond well to fertilizer and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or stones, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel or stones, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 16 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders or of organic matter. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the

water. The content of large stones affects the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones. The performance of a system is affected by the depth of the root zone and soil reaction.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, and slope affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

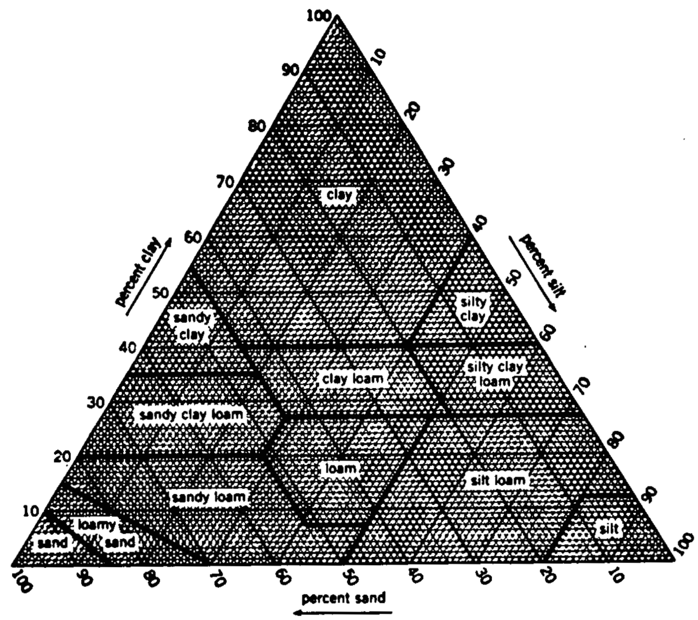


Figure 8.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 17 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 8). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of

grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 18 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to

buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 20 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 20 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 18, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 19 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 19, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 19 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 19 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 19.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. Table 19 shows the expected total subsidence, which usually is a result of oxidation.

Not shown in the table is subsidence caused by an imposed surface load or by the withdrawal of ground water throughout an extensive area as a result of lowering the water table.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*14*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Spodosol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquod (*Aqu*, meaning water, plus *od*, from Spodosol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquods (*Hapl*, meaning minimal horizonation, plus *aquod*, the suborder of the Spodosols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Entic* identifies the subgroup that is more weakly developed than is typical for the great group. An example is Entic Haplaquods.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is sandy, mixed, mesic Entic Haplaquods.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*11*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*14*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Adrian Series

The Adrian series consists of very poorly drained soils formed in deposits of organic material 16 to 51 inches deep over sandy material. These soils are along drainageways and in depressional areas on outwash plains, till plains, and moraines. Permeability is moderately slow to moderately rapid in the organic material and rapid in the substratum. Slope is less than 2 percent.

Adrian soils are similar to Palms soils and are commonly adjacent to Granby, Houghton, Martisco, and

Palms soils. The adjacent soils are in depressional areas. Palms soils are underlain by loamy deposits. Granby soils are not organic. Houghton soils are organic to a depth of more than 51 inches. Martisco soils are organic to a depth of less than 16 inches and are underlain by marl.

Typical pedon of Adrian muck, 366 feet north and 86 feet east of the southwest corner of sec. 1, T. 1 N., R. 11 W.

Op—0 to 13 inches; black (10YR 2/1), broken face and rubbed, sapric material; weak fine subangular blocky structure; very friable; few very fine roots; medium acid; abrupt smooth boundary.

Oa—13 to 34 inches; black (5YR 2/1), broken face and rubbed, sapric material; about 10 percent fiber; moderate medium subangular blocky structure; friable; strongly acid; abrupt smooth boundary.

Cg—34 to 60 inches; grayish brown (2.5Y 5/2) sand; single grain; loose; neutral.

The organic material ranges from 16 to 51 inches in thickness. It ranges from strongly acid to neutral. It is mainly herbaceous. In some pedons, however, as much as 20 percent of the organic material is woody fragments.

The surface tier has hue of 10YR or is neutral in hue. It has chroma of 0 to 2. The subsurface tier has hue of 7.5Y or 5Y or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 3. The C horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 or 2. It is dominantly sand, fine sand, or loamy sand. In some pedons, however, it has layers of finer textures. It ranges from neutral to moderately alkaline.

Algansee Series

The Algansee series consists of rapidly permeable, somewhat poorly drained soils formed in sandy deposits on flood plains. Slope ranges from 0 to 3 percent.

Algansee soils are similar to Morocco, Pipestone, and Tedrow soils and are commonly adjacent to Cohoctah and Glendora soils. Morocco and Tedrow soils are not subject to flooding. Pipestone soils have a spodic horizon. Cohoctah and Glendora soils are poorly drained and are in the lower positions on the landscape.

Typical pedon of Algansee loamy sand, protected, 0 to 3 percent slopes, 330 feet south and 255 feet west of the northeast corner of sec. 24, T. 4 N., R. 13 W.

Ap—0 to 9 inches; black (10YR 2/1) loamy sand, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; very friable; slightly acid; abrupt smooth boundary.

C1—9 to 18 inches; dark grayish brown (10YR 4/2) sand; few fine faint grayish brown (10YR 5/2) mottles; single grain; loose; slightly acid; abrupt wavy boundary.

C2—18 to 32 inches; dark yellowish brown (10YR 4/4) sand; common medium distinct strong brown (7.5YR 5/6) and few fine faint grayish brown (10YR 5/2) mottles; single grain; loose; slightly acid; abrupt wavy boundary.

C3—32 to 60 inches; brown (10YR 4/3) sand; few fine faint grayish brown (10YR 5/2) mottles; single grain; loose; slightly acid.

Reaction ranges from medium acid to neutral in the solum and from medium acid to mildly alkaline in the C horizon. The A horizon has value of 2 to 4 and chroma of 1 or 2. It is dominantly loamy sand, but the range includes sand, fine sandy loam, and sandy loam. The C horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 3 to 6, and chroma of 2 to 4. It is dominantly sand, fine sand, loamy sand, or loamy fine sand. In some pedons, however, it has thin strata of loam, sandy loam, or gravel. Some pedons have thin layers darkened by organic matter. These darker layers have value of 2 or 3 and chroma of 1 or 2.

Belleville Series

The Belleville series consists of poorly drained soils formed in sandy deposits and in silty and loamy glacial till or lacustrine sediments. These soils are on till plains and lake plains. Permeability is rapid in the upper part of the pedon and moderately slow in the lower part. Slope is 0 to 2 percent.

Belleville soils are similar to Corunna soils and are commonly adjacent to Blount, Brookston, Corunna, and Wixom soils. Corunna soils have a solum that is finer textured than that of the Belleville soils. Brookston and Corunna soils are in positions on the landscape similar to those of the Belleville soils. Brookston soils are loamy throughout. Blount and Wixom soils are somewhat poorly drained and are in the slightly higher positions on the landscape.

Typical pedon of Belleville loamy sand, 90 feet south and 426 feet west of the northeast corner of sec. 15, T. 4 N., R. 15 W.

Ap—0 to 10 inches; black (10YR 2/1) loamy sand, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; very friable; many roots; less than 1 percent pebbles and cobbles; neutral; abrupt smooth boundary.

A—10 to 13 inches; black (10YR 2/1) and very dark grayish brown (10YR 3/2) loamy sand; weak medium subangular blocky structure; very friable; many roots; less than 1 percent pebbles and cobbles; neutral; gradual wavy boundary.

Bg1—13 to 23 inches; dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) loamy sand; weak fine subangular blocky structure; very friable; common

roots; less than 1 percent pebbles and cobbles; mildly alkaline; clear wavy boundary.
Bg2—23 to 32 inches; grayish brown (2.5Y 5/2) sand; common coarse prominent dark yellowish brown (10YR 4/4) mottles; single grain; loose; few roots; less than 1 percent pebbles and cobbles; mildly alkaline; abrupt smooth boundary.
2Cg1—32 to 38 inches; dark gray (5Y 4/1) silt loam; common medium prominent dark yellowish brown (10YR 4/4) mottles; massive; friable; few roots; about 1 percent pebbles and cobbles; strong effervescence; moderately alkaline; clear wavy boundary.
2Cg2—38 to 50 inches; grayish brown (2.5Y 5/2) loam; common medium prominent dark yellowish brown (10YR 3/4) mottles; massive; friable; few roots; about 1 percent pebbles and cobbles; strong effervescence; moderately alkaline; clear wavy boundary.
2Cg3—50 to 60 inches; light brownish gray (2.5Y 6/2) clay loam; massive; firm; about 1 percent pebbles and cobbles; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to the 2C horizon range from 20 to 40 inches. The content of pebbles and cobbles ranges from 1 to 5 percent throughout the pedon.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly loamy sand, but the range includes sand. The B horizon has value of 4 to 6 and chroma of 1 or 2. It is loamy sand, loamy fine sand, fine sand, or sand. The 2C horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 6. It is silt loam, silty clay loam, or clay loam.

Blount Series

The Blount series consists of somewhat poorly drained, slowly permeable or moderately slowly permeable soils formed in silty glacial till on till plains. Slope ranges from 1 to 4 percent.

Blount soils are similar to Capac soils and are commonly adjacent to Capac, Glynwood, Marlette, and Pewamo soils. Capac soils have less clay throughout than the Blount soils. Glynwood soils are moderately well drained and are in the slightly higher positions on the landscape. Marlette soils are well drained or moderately well drained and are in the higher positions on the landscape. Pewamo soils are poorly drained and are in depressions and drainageways.

Typical pedon of Blount silt loam, 1 to 4 percent slopes, 50 feet south and 525 feet west of the northeast corner of sec. 15, T. 3 N., R. 12 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; firm; about 1 percent pebbles and cobbles; slightly acid; abrupt wavy boundary.
Bt1—6 to 15 inches; brown (10YR 5/3) silty clay loam; common medium distinct dark gray (10YR 4/1) and few fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; many thin gray (10YR 5/1) clay films on faces of peds; strongly acid; gradual smooth boundary.
Bt2—15 to 24 inches; dark brown (10YR 4/3) silty clay loam; common medium distinct dark gray (10YR 4/1) and few fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; very firm; many thin gray (10YR 5/1) clay films on faces of peds; strongly acid; gradual smooth boundary.
Btg—24 to 27 inches; gray (10YR 6/1) silty clay loam; common fine distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; neutral; gradual smooth boundary.
BCg—27 to 30 inches; gray (10YR 5/1) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate coarse platy structure parting to moderate medium angular blocky; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films lining root channels; slight effervescence; mildly alkaline; gradual wavy boundary.
Cg—30 to 50 inches; gray (10YR 5/1) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure; firm; slight effervescence; mildly alkaline; gradual wavy boundary.
C—50 to 60 inches; brown (10YR 5/3) silty clay loam; common medium distinct gray (10YR 6/1) mottles; weak coarse subangular blocky structure; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 25 to 40 inches. Reaction ranges from strongly acid to mildly alkaline in the solum. The content of pebbles and cobbles ranges from 1 to 10 percent throughout the solum.

The Ap horizon has value of 3 or 4 and chroma of 1 or 2. It is dominantly silt loam, but the range includes loam. The B horizon has value of 4 to 6 and chroma of 1 to 4. It is clay loam, silty clay loam, silty clay, or clay. The C horizon has value of 5 or 6 and chroma of 1 to 4. It is silty clay loam or clay loam. Some pedons have streaks of lime.

Brady Series

The Brady series consists of somewhat poorly drained, moderately rapidly permeable soils formed in sandy and loamy glaciofluvial deposits on outwash plains, valley trains, and lake plains. Slope ranges from 0 to 3 percent.

Brady soils are similar to Matherton soils and are commonly adjacent to Ockley, Oshtemo, and Sebewa

soils. Matherton soils are finer textured in the upper part of the solum than the Brady soils. Ockley and Oshtemo soils are well drained and are in the higher positions on the landscape. Sebewa soils are poorly drained and are in depressions and drainageways.

Typical pedon of Brady sandy loam, 0 to 3 percent slopes, 530 feet south and 770 feet west of the center of sec. 13, T. 4 N., R. 11 W.

Ap—0 to 9 inches; dark brown (10YR 3/3) sandy loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; friable; common fine roots; about 5 percent pebbles; medium acid; abrupt wavy boundary.

E—9 to 12 inches; brown (10YR 5/3) sandy loam; common medium prominent strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; friable; common fine roots; about 5 percent pebbles; strongly acid; clear wavy boundary.

Bt1—12 to 21 inches; strong brown (7.5YR 4/6) loam; many coarse prominent grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; few very fine roots; clay bridging between sand grains and clay films on faces of some peds; about 5 percent pebbles; strongly acid; clear wavy boundary.

Bt2—21 to 29 inches; yellowish brown (10YR 5/4) loamy sand; many coarse distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; very friable; few very fine roots; clay bridging between sand grains; about 8 percent pebbles; strongly acid; abrupt wavy boundary.

Bt3—29 to 36 inches; strong brown (7.5YR 4/6) sandy clay loam; many coarse prominent dark grayish brown (10YR 4/2) mottles; weak coarse subangular blocky structure; friable; few very fine roots; clay films on faces of some peds; about 8 percent pebbles; medium acid; clear wavy boundary.

BC—36 to 55 inches; dark yellowish brown (10YR 4/4) loamy sand; many coarse distinct grayish brown (10YR 5/2) mottles; single grain; loose; about 1 percent pebbles; slightly acid; clear wavy boundary.

C—55 to 60 inches; grayish brown (10YR 5/2) coarse sand; single grain; loose; about 2 percent pebbles and cobbles; mildly alkaline.

The solum ranges from 40 to 60 inches in thickness. It is strongly acid to slightly acid. The content of pebbles and cobbles ranges from 1 to 10 percent in the solum.

The Ap horizon has value of 2 or 3 and chroma of 1 to 3. It is dominantly sandy loam, but the range includes loamy sand. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is loamy sand, sandy loam, sandy clay loam, clay loam, or loam. The C horizon has value of 5 or 6 and chroma of 1 to 3. It is sand, coarse sand, or gravelly sand.

Brookston Series

The Brookston series consists of very poorly drained, moderately permeable soils formed in loamy glacial till on till plains and moraines. Slope is 0 to 2 percent.

Brookston soils are similar to Colwood, Pewamo, and Sebewa soils and are commonly adjacent to Belleville, Blount, Capac, Marlette, and Pewamo soils. Colwood soils have a stratified sandy, loamy, and silty substratum. Pewamo soils are finer textured than the Brookston soils. Sebewa soils have a sandy substratum. Belleville soils are sandy in the upper part of the solum. Pewamo and Belleville soils are in positions on the landscape similar to those of the Brookston soils. The somewhat poorly drained Blount and Capac soils and the well drained or moderately well drained Marlette soils are in the higher positions on the landscape.

Typical pedon of Brookston loam, 90 feet north and 1,550 feet east of the southwest corner of sec. 29, T. 4 N., R. 15 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure; friable; common fine roots; about 1 percent pebbles; neutral; abrupt wavy boundary.

BAg—10 to 25 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; common fine distinct reddish brown (5YR 4/3) mottles; weak coarse prismatic structure parting to moderate fine subangular blocky; friable; few very fine roots; about 1 percent pebbles; neutral; clear wavy boundary.

Btg1—25 to 38 inches; dark gray (10YR 4/1) clay loam; common medium prominent strong brown (7.5YR 5/8) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; few very fine roots; dark gray (10YR 4/1) clay films on faces of peds; about 1 percent pebbles; neutral; gradual wavy boundary.

Btg2—38 to 46 inches; dark grayish brown (10YR 4/2) clay loam; many medium prominent strong brown (7.5YR 5/8) mottles; weak fine subangular blocky structure; firm; few very fine roots; dark gray (10YR 4/1) clay films on faces of peds; about 1 percent pebbles; neutral; gradual wavy boundary.

Cg—46 to 60 inches; gray (10YR 6/1) clay loam; many medium prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; firm; few very fine roots; about 3 percent pebbles; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 30 to 50 inches. Reaction is slightly acid or neutral in the solum and mildly alkaline or moderately alkaline in the C horizon. The content of pebbles ranges from 1 to 10 percent throughout the pedon.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly loam, but the range includes clay loam and silt loam. The Btg horizon has value of 4 to 6 and chroma of 1 or 2. It is clay loam or silty clay loam. The C horizon has value of 5 to 7 and chroma of 1 to 4. It is loam or clay loam.

Capac Series

The Capac series consists of somewhat poorly drained, moderately slowly permeable soils formed in loamy glacial till on moraines and till plains. Slope ranges from 0 to 6 percent.

Capac soils are similar to Blount and Metamora soils and are commonly adjacent to Brookston, Marlette, Metamora, Rimer, and Wixom soils. Blount soils are finer textured in the subsoil and substratum than the Capac soils. Metamora soils are coarser textured in the upper part of the solum than the Capac soils. Brookston soils are very poorly drained and are in depressions and drainageways. Marlette soils are well drained or moderately well drained and are in the higher positions on the landscape. Rimer and Wixom soils are sandy in the upper part of the solum. They are in positions on the landscape similar to those of the Capac soils.

Typical pedon of Capac loam, 0 to 6 percent slopes, 1,320 feet north and 177 feet west of the southeast corner of sec. 35, T. 4 N., R. 15 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; friable; common roots; about 1 percent pebbles and cobbles; neutral; abrupt wavy boundary.

B/E—9 to 13 inches; yellowish brown (10YR 5/6) clay loam (Bt); light brownish gray (10YR 6/2) sandy loam coatings more than 2 millimeters thick between vertical faces of peds (E); common fine distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; few thin light brownish gray (10YR 6/2) clay films on vertical faces of peds; few roots; about 1 percent pebbles and cobbles; medium acid; clear wavy boundary.

Bt—13 to 27 inches; yellowish brown (10YR 5/6) clay loam; many medium prominent gray (10YR 5/1) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few thin grayish brown (10YR 5/2) clay films on vertical faces of peds; few roots; about 1 percent pebbles and cobbles; neutral; gradual wavy boundary.

C1—27 to 38 inches; brown (10YR 5/3) clay loam; grayish brown (2.5Y 5/2) faces of peds; few fine prominent yellowish brown (10YR 5/6) mottles; weak thick platy structure parting to moderate fine angular blocky; firm; about 1 percent pebbles and cobbles; slight effervescence; mildly alkaline; gradual wavy boundary.

C2—38 to 60 inches; yellowish brown (10YR 5/4) loam; common medium prominent gray (10YR 6/1) and yellowish brown (10YR 5/8) mottles; weak fine subangular blocky structure; firm; about 3 percent pebbles and cobbles; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 25 to 40 inches. The content of pebbles ranges from 1 to 10 percent throughout the pedon. Reaction is medium acid or neutral in the solum.

The Ap horizon has value of 3 or 4 and chroma of 1 to 3. It is dominantly loam, but the range includes sandy loam. The E part of the B/E horizon has value of 5 or 6 and chroma of 1 or 2. It is loam or sandy loam. The B part of the B/E horizon and the Bt horizon have value of 4 to 6 and chroma of 2 to 6. They are clay loam, silty clay loam, loam, or sandy clay loam. The C horizon has value of 5 or 6 and chroma of 2 to 6.

Chelsea Series

The Chelsea series consists of somewhat excessively drained, rapidly permeable soils formed in sandy deposits on outwash plains and moraines. Slope ranges from 0 to 35 percent.

Chelsea soils are similar to Oakville soils and are commonly adjacent to Oakville and Oshtemo soils. Oakville soils do not have thin lamellae within a depth of 60 inches. Oshtemo soils are finer textured than the Chelsea soils and have a continuous argillic horizon. They are in positions on the landscape similar to those of the Chelsea soils.

Typical pedon of Chelsea loamy fine sand, 0 to 6 percent slopes, 1,435 feet north and 410 feet east of the southwest corner of sec. 35, T. 2 N., R. 14 W.

O—1 inch to 0; very dark brown (10YR 2/2) hemic material; weak thin platy structure; very friable; strongly acid; abrupt smooth boundary.

A—0 to 4 inches; very dark brown (10YR 2/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak very fine granular structure; very friable; medium acid; gradual wavy boundary.

E—4 to 29 inches; dark yellowish brown (10YR 4/6) fine sand; weak very fine granular structure; loose; medium acid; gradual wavy boundary.

E&Bt—29 to 60 inches; brownish yellow (10YR 6/6) fine sand (E); single grain; loose; lamellae of strong brown (7.5YR 5/6) loamy fine sand (Bt); weak fine subangular blocky structure; wavy and discontinuous lamellae 0.25 to 0.75 inch thick, with a total thickness of 4 inches; medium acid.

The thickness of the solum ranges from 50 to more than 60 inches. Reaction ranges from strongly acid to neutral throughout the pedon.

The A horizon has value of 2 to 4 and chroma of 1 to 3. It is dominantly loamy fine sand, but the range includes fine sand. The E horizon and the E part of the E&Bt horizon have chroma of 4 to 6. The B part of the E&Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is loamy fine sand or loamy sand.

Cohoctah Series

The Cohoctah series consists of poorly drained, moderately rapidly permeable soils formed in stratified loamy and sandy deposits on flood plains. Slope is 0 to 2 percent.

Cohoctah soils are commonly adjacent to Glendora, Sebewa, and Sloan soils. Glendora soils are coarser textured than the Cohoctah soils. They are in positions on the landscape similar to those of the Cohoctah soils. Sebewa soils have a sandy substratum. They are in the slightly higher positions on the landscape. Sloan soils are finer textured than the Cohoctah soils. They are in positions on the landscape similar to those of the Cohoctah soils.

Typical pedon of Cohoctah silt loam, 2,290 feet north and 660 feet west of the southeast corner of sec. 25, T. 4 N., R. 14 W.

A—0 to 12 inches; very dark grayish brown (10YR 3/2) silt loam, dark gray (10YR 4/1) dry; medium coarse granular structure; friable; few coarse, common medium, and many fine and very fine roots; mildly alkaline; abrupt smooth boundary.

Cg1—12 to 18 inches; dark gray (10YR 4/1) loam; many medium distinct dark yellowish brown (10YR 4/6) mottles; weak medium subangular blocky structure; friable; common medium and many fine and very fine roots; mildly alkaline; clear wavy boundary.

Cg2—18 to 42 inches; gray (10YR 5/1) sandy loam; bands of very dark gray (10YR 3/1) sandy loam; many medium distinct dark yellowish brown (10YR 4/4) and few fine distinct light olive brown (2.5Y 5/4) mottles; massive; friable; common fine and very fine roots; mildly alkaline; abrupt smooth boundary.

Cg3—42 to 60 inches; gray (10YR 5/1) loamy sand; few fine distinct light olive brown (2.5Y 5/4) mottles; single grain; loose; moderately alkaline.

Reaction ranges from neutral to moderately alkaline throughout the pedon. The A horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly silt loam, but the range includes sandy loam, loam, and fine sandy loam. The C horizon has chroma of 1 to 3. It is dominantly loamy sand, sand, fine sandy loam, loam, or sandy loam. In some pedons, however, it has thin layers of organic matter and silt loam.

Colwood Series

The Colwood series consists of poorly drained, moderately permeable soils formed in stratified silty, sandy, and loamy deposits on outwash plains and lake plains. Slope is 0 to 2 percent.

Colwood soils are similar to Brookston and Sebewa soils and are commonly adjacent to Kibbie, Metamora, and Thetford soils. Brookston soils do not have a stratified substratum. Sebewa soils have a sandy substratum. Kibbie, Metemora, and Thetford soils are somewhat poorly drained and are in the slightly higher positions on the landscape.

Typical pedon of Colwood silt loam, 2,540 feet north and 1,430 feet east of the southwest corner of sec. 3, T. 3 N., R. 12 W.

Ap—0 to 12 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate medium granular structure; firm; few fine and many very fine roots; mildly alkaline; abrupt wavy boundary.

Bg—12 to 32 inches; gray (10YR 5/1) silt loam; common fine prominent dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; neutral; clear wavy boundary.

Cg—32 to 60 inches; gray (10YR 5/1) stratified silt loam, fine sandy loam, fine sand, and loamy sand; common fine prominent dark yellowish brown (10YR 4/6) and few fine prominent light yellowish brown (2.5Y 6/4) mottles; massive; firm; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 50 inches. Reaction ranges from slightly acid to mildly alkaline in the solum.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly silt loam, but the range includes loam, fine sandy loam, and very fine sandy loam. The Bg horizon has value of 5 or 6 and chroma of 1 or 2. It is loam, silt loam, clay loam, silty clay loam, or fine sandy loam. The C horizon has value of 5 or 6 and chroma of 1 or 2. It is dominantly silt loam, fine sand, or fine sandy loam. In some pedons, however, it has strata of loam, clay loam, or silty clay loam.

Corunna Series

The Corunna series consists of poorly drained soils formed in loamy and sandy lacustrine sediments and in the underlying loamy glacial till. These soils are on lake plains and till plains. Permeability is moderate or moderately rapid in the upper part of the pedon and moderately slow in the lower part. Slope is 0 to 2 percent.

Corunna soils are similar to Belleville soils and are commonly adjacent to Belleville, Brookston, Metamora,

and Wixom soils. Belleville soils are coarser textured in the upper part of the solum than the Corunna soils. Brookston soils are finer textured than the Corunna soils. They are in positions on the landscape similar to those of the Corunna soils. Metamora and Wixom soils are somewhat poorly drained and are in the slightly higher positions on the landscape.

Typical pedon of Corunna sandy loam, 312 feet north and 2,110 feet east of the southwest corner of sec. 1, T. 4 N., R. 15 W.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; common fine prominent strong brown (7.5YR 4/6) mottles; weak fine subangular blocky structure; friable; common roots; about 2 percent pebbles and cobbles; slightly acid; abrupt smooth boundary.

Bg1—11 to 26 inches; grayish brown (10YR 5/2) sandy loam; many medium prominent strong brown (7.5YR 4/6) mottles; weak medium subangular blocky structure; very friable; few roots; about 2 percent pebbles and cobbles; slightly acid; clear wavy boundary.

Bg2—26 to 33 inches; gray (10YR 5/1) loam and loamy sand; many coarse prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; few roots; about 2 percent pebbles and cobbles; neutral; clear wavy boundary.

2Cg1—33 to 50 inches; gray (10YR 5/1) clay loam; many coarse prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; about 2 percent pebbles and cobbles; mildly alkaline; clear wavy boundary.

2Cg2—50 to 60 inches; brown (10YR 5/3) loam; common medium distinct gray (10YR 5/1) mottles; weak medium subangular blocky structure; friable; about 6 percent pebbles and cobbles; strong effervescence; moderately alkaline.

The solum ranges from 30 to 40 inches in thickness. It is slightly acid to mildly alkaline. The content of pebbles and cobbles ranges from 1 to 10 percent throughout the pedon.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly sandy loam, but the range includes fine sandy loam and loam. The B horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 3. It is loamy sand, sandy loam, fine sandy loam, or loam. The 2C horizon has value of 4 to 6 and chroma of 1 to 4. It is loam, clay loam, or silty clay loam.

Covert Series

The Covert series consists of moderately well drained, rapidly permeable soils formed in sandy deposits on lake plains, till plains, and outwash plains. Slope ranges from 0 to 4 percent.

These soils are taxadjuncts to the Covert series because they have value and chroma of 3 in the upper part of the spodic horizon. This difference, however, does not significantly affect the usefulness or behavior of the soils.

Covert soils are commonly adjacent to Oakville, Morocco, and Pipestone soils. Oakville soils are well drained or moderately drained, do not have a spodic horizon, and are in positions on the landscape similar to those of the Covert soils. Morocco and Pipestone soils are somewhat poorly drained and are in the lower positions on the landscape.

Typical pedon of Covert sand, 0 to 4 percent slopes, 66 feet south and 300 feet west of the northeast corner of sec. 12, T. 3 N., R. 14 W.

A—0 to 3 inches; black (10YR 2/1) sand, dark gray (10YR 4/1) dry; weak medium granular structure; very friable; common fine roots; very strongly acid; abrupt wavy boundary.

E—3 to 7 inches; pinkish gray (7.5YR 6/2) sand; single grain; loose; common very fine roots; very strongly acid; abrupt wavy boundary.

Bhs—7 to 11 inches; dark reddish brown (5YR 3/3) sand; very weak medium subangular blocky structure; very friable; common very fine roots; strongly acid; abrupt wavy boundary.

Bs—11 to 19 inches; brown (7.5YR 4/4) sand; single grain; loose; few very fine roots; medium acid; clear wavy boundary.

BC—19 to 34 inches; strong brown (7.5YR 5/6) sand; few fine faint reddish yellow (7.5YR 6/8) mottles; single grain; loose; few very fine roots; medium acid; gradual wavy boundary.

C—34 to 60 inches; pale brown (10YR 6/3) sand; few fine distinct brownish yellow (10YR 6/6) mottles; single grain; loose; few very fine roots; medium acid.

The solum ranges from 24 to 40 inches in thickness. It is very strongly acid to neutral. The content of pebbles ranges from 0 to 5 percent throughout the solum.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. It is dominantly sand, but the range includes loamy sand. The E horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 1 to 3. It is sand or loamy sand. The B horizon has hue of 5YR, 7.5YR, or 10YR, value of 3 to 5, and chroma of 3 to 6. The content of ortstein in the Bhs horizon ranges from 0 to 30 percent, by volume. The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is sand or fine sand.

Glendora Series

The Glendora series consists of poorly drained, rapidly permeable soils formed in sandy deposits on flood plains. Slope is 0 to 2 percent.

Glendora soils are commonly adjacent to Cohoctah, Granby, and Sloan soils. Granby soils are less stratified than the Glendora soils and are slightly higher on the landscape. Cohoctah and Sloan soils are finer textured than the Glendora soils. They are in positions on the landscape similar to those of the Glendora soils.

Typical pedon of Glendora loamy sand, 462 feet east and 150 feet north of the center of sec. 3, T. 2 N., R. 15 W.

Ap—0 to 10 inches; black (N 2/0) loamy sand, very dark gray (10YR 3/1) dry; weak fine granular structure; very friable; few fine roots; slightly acid; abrupt smooth boundary.

C1—10 to 21 inches; grayish brown (10YR 5/2) fine sand; bands of black (N 2/0) fine sand; weak fine subangular blocky structure; very friable; few fine roots; slightly acid; clear wavy boundary.

C2—21 to 32 inches; grayish brown (10YR 5/2) fine sand; few medium prominent strong brown (7.5YR 5/6) mottles; single grain; loose; few fine roots; neutral; clear wavy boundary.

C3—32 to 60 inches; yellowish brown (10YR 5/4) sand; many coarse distinct grayish brown (10YR 5/2) and many medium prominent strong brown (7.5YR 5/6) mottles; single grain; loose; few fine roots; about 1 percent gravel; mildly alkaline.

Reaction ranges from medium acid to mildly alkaline throughout the pedon. The Ap horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is dominantly loamy sand, but the range includes sandy loam, fine sand, and sand. The C horizon has value of 2 to 6 and chroma of 1 to 4. It is sand, fine sand, loamy fine sand, or loamy sand. It has thin bands of organic matter that are similar in color to the A horizon.

Glynwood Series

The Glynwood series consists of moderately well drained, slowly permeable soils formed in loamy and clayey till on till plains and moraines. Slope ranges from 1 to 12 percent.

Glynwood soils are commonly adjacent to Blount, Capac, Marlette, and Pewamo soils. Blount and Capac soils are somewhat poorly drained and are in the slightly lower positions on the landscape. Marlette soils are well drained or moderately well drained. They have less clay in the subsoil than the Glynwood soils. They are in the slightly higher positions on the landscape. Pewamo soils are poorly drained and are in drainageways and depressions.

Typical pedon of Glynwood clay loam, 1 to 6 percent slopes, 265 feet south and 224 feet east of the northwest corner of sec. 18, T. 4 N., R. 13 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) clay loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; firm; common roots; neutral; abrupt smooth boundary.

Bt1—10 to 22 inches; dark yellowish brown (10YR 4/4) clay; few fine distinct gray (10YR 5/1) mottles; moderate fine subangular blocky structure; firm; common roots; many thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of some peds; light brownish gray coatings on faces of peds; medium acid; clear wavy boundary.

Bt2—22 to 29 inches; dark brown (10YR 4/3) clay; many fine distinct gray (10YR 6/1) mottles; moderate fine subangular blocky structure; firm; few roots; many thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of some peds; slightly acid; clear wavy boundary.

C—29 to 60 inches; yellowish brown (10YR 5/4) clay loam; many fine distinct gray (10YR 6/1) mottles; weak fine subangular blocky structure; firm; about 1 percent pebbles; light gray (10YR 7/1) lime coatings on faces of peds; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 16 to 35 inches. The content of pebbles ranges from 0 to 10 percent throughout the pedon.

The Ap horizon has value of 4 or 5 and chroma of 2 to 4. It is dominantly clay loam, but the range includes loam, silt loam, and silty clay loam. The B horizon has value of 4 or 5 and chroma of 2 to 6. It is clay, silty clay, clay loam, or silty clay loam. The C horizon has value of 4 to 6 and chroma of 2 to 6. It is clay loam or silty clay loam.

Granby Series

The Granby series consists of poorly drained, rapidly permeable soils formed in sandy deposits. These soils are in drainageways and depressions on outwash plains and lake plains. Slope is 0 to 2 percent.

Granby soils are similar to Newton soils and are commonly adjacent to Adrian, Glendora, Newton, and Tedrow soils. Adrian soils are organic. They are in positions on the landscape similar to those of the Granby soils or are in the slightly lower positions. Glendora soils have a dark surface layer that is thinner than that of the Granby soils. The poorly drained Newton soils are more acid than the Granby soils. The somewhat poorly drained Tedrow soils are in the slightly higher positions on the landscape.

Typical pedon of Granby loamy sand, 1,780 feet north and 110 feet west of the southeast corner of sec. 35, T. 4 N., R. 11 W.

Ap—0 to 11 inches; very dark gray (10YR 3/1) loamy sand, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; very friable; few very fine and fine roots; less than 2 percent pebbles and cobbles; slightly acid; abrupt smooth boundary.

Bg—11 to 26 inches; light brownish gray (10YR 6/2) sand; few fine distinct yellowish brown (10YR 5/4) mottles; very weak fine subangular blocky structure; very friable; few very fine roots; less than 2 percent pebbles and cobbles; slightly acid; clear wavy boundary.

C—26 to 60 inches; brown (10YR 5/3) sand; few fine distinct yellowish brown (10YR 5/6) mottles; single grain; loose; less than 2 percent pebbles and cobbles; neutral.

The solum ranges from 24 to 40 inches in thickness. It is medium acid to neutral.

The Ap horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is dominantly loamy sand, but the range includes sand, sandy loam, and the mucky analogs of these textures. The B horizon has value of 4 to 6 and chroma of 1 to 3. It is dominantly loamy sand, sand, fine sand, or loamy fine sand. In some pedons, however, it has thin layers of sandy loam, clay loam, or sandy clay loam. The C horizon has value of 5 to 7 and chroma of 1 to 4. It is sand or fine sand. It is neutral to moderately alkaline.

Houghton Series

The Houghton series consists of very poorly drained soils formed in organic deposits more than 51 inches thick. These soils are in depressional areas on outwash plains, lake plains, till plains, and moraines. Permeability ranges from moderately slow to moderately rapid. Slope is 0 to 2 percent.

Houghton soils are commonly adjacent to Adrian and Palms soils. The muck in Adrian and Palms soils is shallow over mineral material. These soils are in positions on the landscape similar to those of the Houghton soils.

Typical pedon of Houghton muck, 156 feet south and 88 feet west of the center of sec. 35, T. 4 N., R. 11 W.

Oa1—0 to 12 inches; black (N 2/0), broken face and rubbed, sapric material; about 5 percent fiber, less than 5 percent rubbed; weak very fine granular structure; very friable; few roots; slightly acid; clear wavy boundary.

Oa2—12 to 17 inches; dark reddish brown (5YR 2/2), broken face and rubbed, sapric material; about 15 percent fiber, less than 5 percent rubbed; weak coarse subangular blocky structure; friable; few roots; slightly acid; gradual wavy boundary.

Oa3—17 to 28 inches; black (5YR 2/1), broken face and rubbed, sapric material; about 25 percent fiber, less than 5 percent rubbed; weak coarse subangular blocky structure; friable; mildly alkaline; gradual wavy boundary.

Oa4—28 to 60 inches; black (5YR 2/1), broken face and rubbed, sapric material; about 20 percent fiber, 10 percent rubbed; very weak fine subangular blocky structure; very friable; mildly alkaline.

The organic material is more than 51 inches thick. It ranges from slightly acid to mildly alkaline. It is mainly herbaceous. In some pedons, however, it has woody fragments, 1 to 8 inches in diameter, that cannot be crushed between the fingers.

The surface layer has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The subsurface layer has hue of 5YR or is neutral. It has value of 2 or 3 and chroma of 0 to 3. Chroma may change 1 or 2 units from broken face to rubbed. The subsurface layer is dominantly sapric material, but in some pedons it has hemic material. The layers of hemic material total less than 10 inches thick.

Kibbie Series

The Kibbie series consists of somewhat poorly drained, moderately permeable soils formed in stratified loamy and silty deposits on lake plains, till plains, outwash plains, and deltas. Slope ranges from 0 to 3 percent.

Kibbie soils are similar to Matherton soils and are commonly adjacent to Blount, Capac, Colwood, Marlette, and Metamora soils. Matherton soils have a sandy substratum. Blount, Capac, and Metamora soils are not stratified and are somewhat poorly drained. They are in positions on the landscape similar to those of the Kibbie soils. Colwood soils are poorly drained and are in depressions. Marlette soils are moderately well drained or well drained and are in the higher positions on the landscape.

Typical pedon of Kibbie fine sandy loam, 0 to 3 percent slopes, 940 feet north and 775 feet west of the southeast corner of sec. 35, T. 1 N., R. 12 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; friable; common roots; less than 1 percent pebbles and cobbles; neutral; abrupt wavy boundary.

E—9 to 12 inches; pale brown (10YR 6/3) loam, few fine prominent yellowish red (5YR 5/8) mottles; moderate very fine subangular blocky structure; friable; common roots; less than 1 percent pebbles and cobbles; neutral; clear wavy boundary.

Bt1—12 to 20 inches; brown (10YR 5/3) loam; common medium distinct yellowish brown (10YR 5/8) mottles; moderate fine subangular blocky structure; friable; few roots; many thin brown (10YR 5/3) clay films on

faces of some peds; less than 1 percent pebbles and cobbles; neutral; abrupt wavy boundary.

Bt2—20 to 25 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct yellowish brown (10YR 5/8) and light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; many thick grayish brown (10YR 5/2) clay films on faces of some peds; less than 1 percent pebbles and cobbles; neutral; clear wavy boundary.

C—25 to 60 inches; yellowish brown (10YR 5/4) silty clay loam, very fine sandy loam, and silt loam; common fine distinct yellowish brown (10YR 5/8) mottles; weak thick platy structure parting to moderate very fine angular blocky; friable; less than 1 percent pebbles and cobbles; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 24 to 40 inches. Reaction is medium acid to neutral in the solum.

The Ap horizon has value of 2 or 3 and chroma of 1 to 3. It is dominantly fine sandy loam, but the range includes sandy loam, silt loam, and loam. The B horizon has value of 4 or 5 and chroma of 3 to 6. It is loam, clay loam, silty clay loam, or silt loam. The C horizon has value of 5 or 6 and chroma of 2 to 4.

Marlette Series

The Marlette series consists of well drained or moderately well drained, moderately slowly permeable soils formed in loamy, calcareous till on moraines. Slope ranges from 1 to 35 percent.

Marlette soils are similar to Riddles and Ockley soils and are commonly adjacent to Blount, Brookston, Capac, and Tekenink soils. Riddles and Ockley soils are coarser textured in the substratum than the Marlette soils. Blount and Capac soils are somewhat poorly drained and are in the slightly lower positions on the landscape. Brookston soils are very poorly drained and are in depressions and drainageways. Tekenink soils are coarser textured throughout than the Marlette soils. They are in positions on the landscape similar to those of the Marlette soils.

Typical pedon of Marlette loam, in an area of Marlette-Capac loams, 1 to 6 percent slopes, 400 feet north and 265 feet west of the southeast corner of sec. 21, T. 4 N., R. 11 W.

Ap—0 to 10 inches; brown (10YR 5/3) loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common roots; about 6 percent pebbles and cobbles; medium acid; clear wavy boundary.

B/E—10 to 24 inches; brown (10YR 4/3) clay loam (Bt); pale brown (10YR 6/3) loam coatings (E) on the vertical faces of peds; moderate medium angular blocky structure; firm; few roots; dark brown (7.5YR 4/4) clay films on faces of some peds; about 2 percent pebbles and cobbles; medium acid; gradual wavy boundary.

Bt—24 to 38 inches; brown (10YR 4/3) clay loam; moderate medium subangular blocky structure; firm; few roots; dark brown (7.5YR 4/4) clay films on faces of some peds; about 5 percent pebbles and cobbles; neutral; gradual wavy boundary.

C1—38 to 45 inches; brown (10YR 5/3) loam; weak thin platy structure parting to moderate very fine subangular blocky; firm; about 7 percent pebbles and cobbles; strong effervescence; moderately alkaline; abrupt wavy boundary.

C2—45 to 60 inches; dark brown (7.5YR 4/4) clay loam; few fine prominent red (2.5YR 4/8) mottles; weak medium subangular blocky structure; friable; about 10 percent pebbles and cobbles; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to carbonates range from 28 to 50 inches. Reaction is medium acid to neutral in the solum. The content of pebbles and cobbles ranges from 2 to 10 percent throughout the pedon.

The Ap horizon has value of 3 to 5 and chroma of 2 or 3. It is dominantly loam, but the range includes sandy loam. The E part of the B/E horizon has value of 5 to 7 and chroma of 2 or 3. It is sandy loam or loam. The B part of the B/E horizon and the Bt horizon have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. They are loam or clay loam. The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4.

Martisco Series

The Martisco series consists of very poorly drained soils formed in deposits of organic material less than 16 inches deep over marl. These soils are in depressional areas on outwash plains, flood plains, and till plains. Permeability is moderate or moderately rapid in the upper part of the pedon and slow in the lower part. Slope is 0 to 2 percent.

Martisco soils are commonly adjacent to Adrian and Palms soils. The muck in Adrian and Palms soils is 16 to 51 inches deep over mineral material. These soils are in positions on the landscape similar to those of the Martisco soils.

Typical pedon of Martisco muck, 1,072 feet east and 15 feet south of the northwest corner of sec. 15, T. 4 N., R. 12 W.

Oa—0 to 11 inches; black (5YR 2/1), broken face and rubbed, sapric material; about 5 percent fiber, less than 1 percent rubbed; weak coarse subangular blocky structure parting to moderate medium granular; friable; common fine and very fine roots; slight effervescence; moderately alkaline; abrupt smooth boundary.

C—11 to 60 inches; light gray (10YR 7.2) marl; massive; friable; common shell fragments; violent effervescence; moderately alkaline.

The organic material ranges from 8 to 16 inches in thickness. It is slightly acid to moderately alkaline. It is mainly herbaceous.

The Oa horizon has hue of 5YR, 7.5YR, or 10YR or is neutral in hue. It has value of 2 and chroma of 0 to 2. The C horizon has hue of 5Y or 10YR or is neutral in hue. It has value of 5 to 8 and chroma of 0 to 2.

Matherton Series

The Matherton series consists of somewhat poorly drained soils formed in loamy material over gravelly and sandy deposits. These soils are on outwash plains, valley trains, and terraces. Permeability is moderate in the upper part of the pedon and rapid or very rapid in the lower part. Slope ranges from 0 to 3 percent.

Matherton soils are similar to Brady and Kibbie soils and are commonly adjacent to Ockley and Sebewa soils. Brady soils are coarser textured in the upper part of the solum than the Matherton soils. Kibbie soils have a stratified loamy and silty substratum. Ockley soils are well drained and are in the higher positions on the landscape. Sebewa soils are poorly drained and are in depressions.

Typical pedon of Matherton loam, 0 to 3 percent slopes, 2,150 feet east and 100 feet north of the southwest corner of sec. 4, T. 4 N., R. 12 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure; friable; neutral; abrupt wavy boundary.

Btg1—8 to 16 inches; grayish brown (10YR 5/2) clay loam; common medium distinct strong brown (7.5YR 5/6) mottles; common thin grayish brown (10YR 5/2) clay films on faces of peds; moderate medium angular blocky structure; friable; neutral; clear wavy boundary.

Btg2—16 to 26 inches; grayish brown (10YR 5/2) sandy clay loam; many coarse distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; mildly alkaline; abrupt wavy boundary.

2C—26 to 60 inches; pale brown (10YR 6/3) gravelly sand; common medium distinct yellowish brown (10YR 5/8) mottles; single grain; loose; about 25 percent pebbles; slight effervescence; mildly alkaline.

The solum ranges from 24 to 40 inches in thickness. It is mildly alkaline or neutral.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly loam, but the range includes sandy loam. Some pedons have an E horizon. The B horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or 3. It is sandy clay loam, clay loam, or loam. The 2C horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 4. It is gravelly sand or sand. In some pedons silty clay loam or clay loam is below a depth of 40 inches.

Metamora Series

The Metamora series consists of somewhat poorly drained soils formed in loamy outwash or lacustrine sediments and in the underlying loamy glacial till. These soils are on lake plains, till plains, and low moraines. Permeability is moderately rapid in the upper part of the pedon and moderately slow in the lower part. Slope ranges from 1 to 4 percent.

Metamora soils are similar to Capac soils and are commonly adjacent to Blount, Capac, Corunna, and Wixom soils. Blount and Capac soils are finer textured in the upper part of the solum than the Metamora soils. Corunna soils are poorly drained and are in depressions and drainageways. Wixom soils have a spodic horizon and are coarser textured in the upper part than the Metamora soils. Blount, Capac, and Wixom soils are in positions on the landscape similar to those of the Metamora soils.

Typical pedon of Metamora sandy loam, 1 to 4 percent slopes, 84 feet south and 1,120 feet west of the northeast corner of sec. 18, T. 4 N., R. 15 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; friable; many roots; about 5 percent pebbles and cobbles; slightly acid; abrupt wavy boundary.

E—9 to 15 inches; brown (10YR 5/3) sandy loam; few medium prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; few roots; about 5 percent pebbles and cobbles; neutral; clear wavy boundary.

BE—15 to 20 inches; grayish brown (10YR 5/2) loamy sand; common medium prominent dark yellowish brown (10YR 4/6) and common medium faint grayish brown (2.5Y 5/2) mottles; massive; weakly cemented; few roots; about 5 percent pebbles and cobbles; neutral; clear wavy boundary.

Btg1—20 to 23 inches; dark grayish brown (10YR 4/2) loam; many medium prominent yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; friable; few roots; dark gray (10YR 4/1) clay films on faces of some peds; about 5 percent pebbles and cobbles; neutral; clear wavy boundary.

2Btg2—23 to 28 inches; gray (10YR 5/1) clay loam; many medium distinct yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; firm; few roots; dark gray (10YR 4/1) and very dark gray (10YR 3/1) clay films on faces of some peds;

about 5 percent pebbles and cobbles; mildly alkaline; clear wavy boundary.

2Cg—28 to 40 inches; dark grayish brown (2.5Y 4/2) loam; gray (10YR 5/1) faces of peds; common medium distinct yellowish brown (10YR 5/6) and gray (10YR 5/1) mottles; weak thick platy structure parting to weak fine subangular blocky; firm; few roots; about 8 percent pebbles and cobbles; strong effervescence; moderately alkaline; diffuse wavy boundary.

2C—40 to 60 inches; brown (10YR 4/3) loam; common medium distinct yellowish brown (10YR 5/6) and many medium distinct gray (10YR 5/1) mottles; weak coarse subangular blocky structure; firm; about 8 percent pebbles and cobbles; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 20 to 40 inches. Reaction ranges from medium acid to mildly alkaline in the solum and is mildly alkaline or moderately alkaline in the 2C horizon. The content of pebbles and cobbles ranges from 1 to 10 percent throughout the pedon.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is dominantly sandy loam, but the range includes loamy sand and fine sandy loam. The B horizon has value of 4 to 6 and chroma of 1 or 2. It is sandy loam, sandy clay loam, or loam. The 2B horizon has value of 5 or 6 and chroma of 1 or 2. It is sandy clay loam, clay loam, silty clay loam, or loam. The 2C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or 3. It is loam, silt loam, clay loam, or silty clay loam.

Metea Series

The Metea series consists of well drained soils formed in sandy material and in the underlying loamy glacial till. These soils are on moraines and till plains. Permeability is rapid in the upper part of the pedon and moderately slow in the lower part. Slope ranges from 1 to 12 percent.

Metea soils are commonly adjacent to Blount, Capac, Marlette, and Rimer soils. Blount, Capac, and Rimer soils are somewhat poorly drained and are in the lower positions on the landscape. Marlette soils are loamy in the upper part of the solum. They are in positions on the landscape similar to those of the Metea soils.

Typical pedon of Metea loamy fine sand, 1 to 6 percent slopes, 528 feet north and 250 feet west of the southeast corner of sec. 20, T. 3 N., R. 11 W.

Ap—0 to 12 inches; very dark grayish brown (10YR 3/2) loamy fine sand, light brownish gray (10YR 6/2) dry; weak very fine subangular blocky structure; very friable; common roots; about 2 percent pebbles and cobbles; slightly acid; abrupt smooth boundary.

BE—12 to 25 inches; yellowish brown (10YR 5/6) loamy fine sand; weak very fine subangular blocky structure; very friable; common roots; about 6 percent pebbles and cobbles; slightly acid; clear wavy boundary.

Bt1—25 to 31 inches; yellowish brown (10YR 5/6) sandy loam; moderate fine subangular blocky structure; friable; common roots; about 5 percent pebbles and cobbles; medium acid; abrupt wavy boundary.

2Bt2—31 to 37 inches; yellowish brown (10YR 5/4) clay loam; common medium faint yellowish brown (10YR 5/6) and few medium distinct yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure; clay films on faces of peds and in root channels; firm; common roots; about 5 percent pebbles and cobbles; slightly acid; gradual wavy boundary.

2Bt3—37 to 41 inches; yellowish brown (10YR 5/4) clay loam; moderate coarse subangular blocky structure; firm; few roots; light gray (10YR 6/1) clay films on faces of peds and in root channels; about 5 percent pebbles and cobbles; neutral; gradual wavy boundary.

2C—41 to 60 inches; brown (10YR 5/3) clay loam; massive; firm; about 5 percent pebbles and cobbles; mildly alkaline.

The thickness of the solum ranges from 40 to 55 inches. The thickness of the upper sandy material ranges from 20 to 40 inches. Reaction is medium acid to neutral in the solum and mildly alkaline or moderately alkaline in the 2C horizon.

The Ap horizon has value of 3 to 5 and chroma of 2 to 4. It is dominantly loamy fine sand, but the range includes loamy sand and sand. The BE horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6. It is loamy sand, loamy fine sand, or sand. The Bt1 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The 2Bt horizon has value of 4 or 5 and chroma of 3 to 6. It is loam or clay loam. The 2C horizon also is loam or clay loam. It has chroma of 3 to 8.

Morocco Series

The Morocco series consists of somewhat poorly drained, rapidly permeable soils formed in sandy deposits on outwash plains and lake plains. Slope ranges from 0 to 3 percent.

Morocco soils are similar to Algansee, Pipestone, and Tedrow soils and are commonly adjacent to Newton, Oakville, Pipestone, and Tedrow soils. Algansee and Tedrow soils are less acid than the Morocco soils. Pipestone soils have a spodic horizon. Newton soils are very poorly drained and are in the lower positions on the landscape. Oakville soils are moderately well drained or well drained and are in the higher positions.

Typical pedon of Morocco fine sand, in an area of Morocco-Newton complex, 0 to 3 percent slopes, 149

feet north and 941 feet west of the southeast corner of sec. 35, T. 2 N., R. 15 W.

A—0 to 1 inch; black (5YR 2/1) fine sand, dark reddish brown (5YR 3/2) dry; weak very fine granular structure; very friable; many fine roots; extremely acid; abrupt wavy boundary.
E—1 to 2 inches; reddish gray (5YR 5/2) fine sand; single grain; loose; common fine roots; extremely acid; abrupt broken boundary.
Bw1—2 to 3 inches; dark brown (7.5YR 3/4) fine sand; few fine faint strong brown (7.5YR 5/6) mottles; single grain; loose; common very fine roots; very strongly acid; abrupt wavy boundary.
Bw2—3 to 10 inches; yellowish brown (10YR 5/4) fine sand; common fine faint brownish yellow (10YR 6/6) mottles; single grain; loose; common fine and medium roots; very strongly acid; clear wavy boundary.
Bw3—10 to 24 inches; yellowish brown (10YR 5/4) fine sand; common fine faint brownish yellow (10YR 6/6) and few fine faint light brownish gray (10YR 6/2) mottles; single grain; loose; few very fine roots; very strongly acid; gradual wavy boundary.
C1—24 to 48 inches; pale brown (10YR 6/3) fine sand; common medium fine light brownish gray (10YR 6/2) and common medium distinct brownish yellow (10YR 6/6) mottles; single grain; loose; very strongly acid; clear wavy boundary.
C2—48 to 60 inches; light yellowish brown (10YR 6/4) fine sand; common fine faint light brownish gray (10YR 6/2) and many medium distinct yellowish brown (10YR 5/6) mottles; single grain; loose; strongly acid.

The solum ranges from 24 to 45 inches in thickness. It is extremely acid to medium acid.

The A horizon has hue of 5YR, 7.5YR, or 10YR, value of 2 or 3, and chroma of 1 or 2. It is dominantly fine sand, but the range includes loamy fine sand. Some pedons do not have an E horizon. The B horizon has chroma of 3 to 8. The C horizon has value of 5 or 6 and chroma of 2 to 4.

Napoleon Series

The Napoleon series consists of very poorly drained soils formed in deep organic deposits. Permeability is moderate or moderately rapid. Slope is 0 to 2 percent.

Napoleon soils are commonly adjacent to Chelsea, Oakville, and Oshtemo soils. The adjacent soils are better drained than the Napoleon soils and are in the higher positions on the landscape.

Typical pedon of Napoleon muck, 462 feet east and 264 feet north of the southwest corner of sec. 24, T. 4 N., R. 11 W.

Oa1—0 to 1 inch; dark reddish brown (5YR 3/2), broken face and rubbed, sapric material; about 70 percent sphagnum fibers, 15 percent rubbed; weak very fine granular structure; friable; many roots; extremely acid; abrupt smooth boundary.
Oa2—1 to 3 inches; black (10YR 2/1), broken face and rubbed, sapric material; about 20 percent sphagnum fibers, less than 5 percent rubbed; weak very fine granular structure; friable; many roots; extremely acid; abrupt smooth boundary.
Oe1—3 to 16 inches; dark reddish brown (5YR 3/2), broken face and rubbed, hemic material; about 50 percent herbaceous fibers, 20 percent rubbed; weak very thick platy structure; friable; few roots; extremely acid; clear wavy boundary.
Oe2—16 to 60 inches; dark reddish brown (5YR 3/2), broken face and rubbed, hemic material; about 90 percent herbaceous fibers, 20 percent rubbed; weak very thick platy structure; friable; extremely acid.

The organic material is more than 51 inches thick. It is mainly herbaceous, but some pedons have woody fragments.

The Oa horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 or 2. The Oe horizon has hue of 5YR or 7.5YR, value of 2 to 4, and chroma of 1 to 3.

Newton Series

The Newton series consists of very poorly drained, rapidly permeable soils formed in acid, sandy deposits on outwash plains and lake plains. Slope is 0 to 2 percent.

Newton soils are similar to Granby soils and are commonly adjacent to Morocco, Oakville, and Pipestone soils. Granby soils are less acid than the Newton soils. Morocco and Pipestone soils are somewhat poorly drained and are in the slightly higher positions on the landscape. Oakville soils are moderately well drained or well drained and are in the higher positions on the landscape.

Typical pedon of Newton mucky fine sand, 2,225 feet north and 412 feet west of the southeast corner of sec. 13, T. 3 N., R. 14 W.

A—0 to 11 inches; black (10YR 2/1) mucky fine sand, very dark gray (10YR 3/1) dry; very weak coarse subangular blocky structure; very friable; many very fine, fine, and medium roots; strongly acid; clear wavy boundary.
C1—11 to 31 inches; dark grayish brown (10YR 4/2) fine sand; single grain; loose; common very fine, fine, and medium roots; very strongly acid; clear wavy boundary.
C2—31 to 60 inches; pale brown (10YR 6/3) fine sand; single grain; loose; very strongly acid.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly mucky fine sand, but the range includes sand and fine sand. This horizon is medium acid to very strongly acid. The C horizon has value of 4 to 6 and chroma of 2 to 8. It is fine sand or sand. It is strongly acid or very strongly acid.

Oakville Series

The Oakville series consists of well drained or moderately well drained soils formed in sandy deposits on outwash plains, lake plains, moraines, dunes, and beach ridges. Permeability generally is rapid throughout the pedon. In the loamy substratum phase, however, it is rapid in the upper part of the pedon and moderately slow in the lower part. Slope ranges from 0 to 45 percent.

Oakville soils are similar to Chelsea soils and are commonly adjacent to Chelsea, Morocco, Newton, and Tedrow soils. Chelsea soils have thin lamellae of sandy loam or loamy sand within a depth of 60 inches. Morocco and Tedrow soils are somewhat poorly drained and are in the lower positions on the landscape. Newton soils are very poorly drained and are in depressions and drainageways.

Typical pedon of Oakville fine sand, 0 to 6 percent slopes, 672 feet north and 100 feet east of southwest corner of sec. 25, T. 4 N., R. 13 W.

Ap—0 to 9 inches; dark brown (10YR 3/3) fine sand, pale brown (10YR 6/3) dry; very weak medium subangular blocky structure; very friable; slightly acid; abrupt smooth boundary.

Bw—9 to 24 inches; yellowish brown (10YR 5/8) fine sand; single grain; loose; about 1 percent pebbles and cobbles; slightly acid; clear wavy boundary.

C—24 to 60 inches; brownish yellow (10YR 6/6) fine sand; single grain; loose; about 1 percent pebbles and cobbles; neutral.

The solum ranges from 18 to 35 inches in thickness. It is very strongly acid to slightly acid.

The Ap horizon has value of 3 or 4 and chroma of 1 to 3. Some pedons have a thin E horizon. The B horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. It is fine sand or sand. The C horizon has value of 5 or 6 and chroma of 4 to 6. It ranges from medium acid to neutral. The loamy substratum phase has a loamy 2C horizon below a depth of 40 inches.

Ockley Series

The Ockley series consists of well drained, moderately permeable soils formed in loamy deposits on moraines, outwash plains, terraces, and valley trains. Slope ranges from 1 to 30 percent.

Ockley soils are similar to Marlette and Riddles soils and are commonly adjacent to Brady, Oshtemo, and Sebewa soils. Marlette soils are finer textured in the substratum than the Ockley soils. Riddles soils are not stratified and do not have a gravelly substratum. Brady soils are somewhat poorly drained and are in the slightly lower positions on the landscape. Oshtemo soils are coarser textured in the upper part than the Ockley soils. Sebewa soils are poorly drained and are in depressions and drainageways.

Typical pedon of Ockley loam, 1 to 6 percent slopes, 790 feet north and 1,120 feet west of the center of sec. 13, T. 4 N., R. 11 W.

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; friable; common roots; about 5 percent pebbles and cobbles; slightly acid; abrupt smooth boundary.

Bt1—11 to 24 inches; dark brown (7.5YR 3/4) sandy clay loam; weak medium subangular blocky structure; friable; few roots; about 10 percent pebbles and cobbles; medium acid; clear wavy boundary.

Bt2—24 to 35 inches; dark brown (7.5YR 3/4) sandy loam; very weak medium subangular blocky structure; very friable; few roots; about 10 percent pebbles and cobbles; strongly acid; abrupt wavy boundary.

Bt3—35 to 42 inches; dark brown (7.5YR 3/4) sandy clay loam; weak medium subangular blocky structure; friable; about 10 percent pebbles and cobbles; medium acid; clear wavy boundary.

2C—42 to 60 inches; dark brown (7.5YR 4/4) gravelly sand; single grain; loose; about 20 percent pebbles and cobbles; slight effervescence in spots; mildly alkaline.

The solum ranges from 40 to 60 inches in thickness. It is slightly acid to strongly acid. The content of pebbles and cobbles ranges from 1 to 15 percent in the solum.

The Ap horizon has value of 4 or 5 and chroma of 2 to 5. It is dominantly loam, but the range includes clay loam and silty clay loam. The B horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 to 6. It is loam, sandy clay loam, or clay loam. The 2C horizon is sand or gravelly sand.

Oshtemo Series

The Oshtemo series consists of well drained, moderately rapidly permeable soils formed in sandy and loamy material on outwash plains, valley trains, and moraines. Slope ranges from 0 to 35 percent.

Oshtemo soils are commonly adjacent to Brady, Chelsea, and Ockley soils. Brady soils are somewhat poorly drained and are in the lower positions on the landscape. Chelsea and Ockley soils are in positions on the landscape similar to those of the Oshtemo soils. Chelsea soils do not have continuous loamy horizons

within a depth of 40 inches. Ockley soils are finer textured in the upper part of the subsoil than the Oshtemo soils.

Typical pedon of Oshtemo loamy sand, in an area of Oshtemo-Chelsea complex, 0 to 6 percent slopes, 450 feet south and 280 feet east of the northwest corner of sec. 34, T. 2 N., R. 11 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) loamy sand, pale brown (10YR 6/3) dry; weak medium subangular structure; very friable; many very fine and fine roots; about 2 percent pebbles and cobbles; slightly acid; abrupt smooth boundary.

Bt1—10 to 28 inches; dark yellowish brown (10YR 4/6) sandy loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; about 2 percent pebbles and cobbles; slightly acid; clear wavy boundary.

Bt2—28 to 35 inches; strong brown (7.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; firm; few very fine and fine roots; about 7 percent pebbles and cobbles; strongly acid; clear wavy boundary.

E&Bt—35 to 60 inches; strong brown (7.5YR 5/6) sand (E); single grain; loose; bands of strong brown (7.5YR 4/6) loamy sand (Bt); very weak medium subangular blocky structure; very friable; wavy and discontinuous bands 0.25 inch to 2.0 inches thick; about 5 percent pebbles; medium acid.

The thickness of the solum ranges from 40 to more than 60 inches. The content of pebbles and cobbles ranges from 1 to 30 percent in the solum.

The Ap horizon has value of 3 to 5 and chroma of 2 or 3. It is dominantly loamy sand, but the range includes sandy loam. Some pedons have an E horizon. The B horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 4 to 6. It is sandy loam, sandy clay loam, or the gravelly analogs of these textures. The E&Bt horizon has hue and value similar to those in the Bt horizon and has chroma of 2 to 6. It is loamy sand, sandy loam, or sand.

Palms Series

The Palms series consists of very poorly drained soils formed in well decomposed organic material 16 to 51 inches deep over silty deposits. These soils are on moraines, lake plains, and outwash plains. Permeability is moderately slow to moderately rapid in the organic material and moderately slow or moderate in the substratum. Slope is 0 to 2 percent.

Palms soils are similar to Adrian soils and are commonly adjacent to Adrian, Houghton, and Martisco soils. Adrian soils are underlain by sandy deposits. Houghton soils are organic to a depth of more than 51 inches. Martisco soils are organic to a depth of less than 16 inches and are underlain by marl. Houghton and Martisco soils are in positions on the landscape similar to those of the Palms soils.

Typical pedon of Palms muck, 120 feet north and 132 feet east of the southwest corner of sec. 22, T. 4 N., R. 15 W.

Oa1—0 to 12 inches; black (10YR 2/1), broken face and rubbed, sapric material; about 10 percent fiber, less than 5 percent rubbed; weak fine granular structure; very friable; many roots; slightly acid; clear wavy boundary.

Oa2—12 to 22 inches; dark reddish brown (5YR 2/2), broken face, and black (5YR 2/1), rubbed, sapric material; about 70 percent fiber, less than 5 percent rubbed; weak coarse subangular blocky structure parting to moderate fine granular; very friable; few roots; slightly acid; clear wavy boundary.

Cg1—22 to 28 inches; very dark gray (10YR 3/1) silt loam; few medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; few roots; neutral; clear wavy boundary.

Cg2—28 to 42 inches; dark gray (5Y 4/1) silt loam; few medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; few roots; neutral; gradual wavy boundary.

Cg3—42 to 60 inches; dark gray (5Y 4/1) silty clay loam; massive; firm; moderately alkaline.

The organic material ranges from 16 to 51 inches in thickness. It is strongly acid to mildly alkaline. It is mainly herbaceous. In some pedons, however, as much as 10 percent of the organic material is woody fragments.

The Oa horizon has hue of 5YR to 10YR and chroma of 1 or 2. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 or 4, and chroma of 1 or 2. It is loam, clay loam, silt loam, silty clay loam, or sandy loam. It is neutral or mildly alkaline.

Pewamo Series

The Pewamo series consists of poorly drained, moderately slowly permeable or slowly permeable soils formed in silty glacial till or lacustrine material. These soils are on till plains and lake plains or in depressional areas on moraines. Slope is 0 to 2 percent.

Pewamo soils are similar to Brookston and Sebewa soils and are commonly adjacent to Blount, Capac, and Glynwood soils. Brookston and Sebewa soils have less clay throughout than the Pewamo soils. Sebewa soils have a sandy substratum. Blount and Capac soils are somewhat poorly drained and are in the slightly higher positions on the landscape. Glynwood soils are moderately well drained and are in the higher positions on the landscape.

Typical pedon of Pewamo silt loam, 33 feet south and 50 feet west of the northeast corner of sec. 1, T. 4 N., R. 12 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silt loam, very dark gray (10YR 3/1) dry; moderate coarse granular structure; firm; common fine roots; neutral; abrupt wavy boundary.
Btg1—10 to 17 inches; gray (10YR 5/1) silty clay loam; common fine prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium angular blocky; firm; discontinuous clay films on faces of peds and in old root channels; few medium and very fine roots; mildly alkaline; clear wavy boundary.
Btg2—17 to 30 inches; gray (10YR 5/1) silty clay; common medium prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to strong coarse angular blocky; firm; discontinuous thin clay films on vertical faces of peds; few medium and very fine roots; mildly alkaline; gradual wavy boundary.
Cg—30 to 60 inches; gray (10YR 6/1) silty clay loam; common medium prominent yellowish brown (10YR 5/8) mottles; massive; firm; strong effervescence; mildly alkaline.

The solum ranges from 28 to 46 inches in thickness. It is neutral or mildly alkaline.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly silt loam, but the range includes loam, clay loam, and silty clay loam. The B horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is silty clay loam, silty clay, or clay loam. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 or 2. It is mildly alkaline or moderately alkaline.

Pipestone Series

The Pipestone series consists of somewhat poorly drained, rapidly permeable soils formed in sandy deposits on outwash plains, lake plains, and till plains. Slope ranges from 0 to 4 percent.

Pipestone soils are similar to Algansee, Morocco, and Tedrow soils and are commonly adjacent to Covert, Morocco, and Newton soils. Algansee, Morocco, and Tedrow soils do not have a spodic horizon. Covert soils are moderately well drained and are in the slightly higher positions on the landscape. Newton soils are very poorly drained and are in depressions and drainageways.

Typical pedon of Pipestone sand, 0 to 4 percent slopes, 219 feet south and 135 feet east of the northwest corner of sec. 13, T. 4 N., R. 16 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) sand, brown (10YR 5/3) dry; very weak very fine subangular blocky structure; very friable; common roots; medium acid; abrupt smooth boundary.
E—9 to 16 inches; pinkish gray (7.5YR 7/2) sand; single grain; loose; few roots; slightly acid; gradual wavy boundary.
Bhs—16 to 20 inches; dark reddish brown (5YR 3/2) sand; few fine faint brown (7.5YR 4/2) and few fine distinct strong brown (7.5YR 5/6) mottles; massive; weakly cemented; strongly acid; clear wavy boundary.
Bs—20 to 24 inches; strong brown (7.5YR 4/6) sand; common fine distinct dark reddish brown (5YR 3/4) and many coarse distinct yellowish brown (10YR 5/6) mottles; about 70 percent massive and 30 percent single grain; weakly cemented and loose; strongly acid; clear wavy boundary.
C—24 to 56 inches; yellowish brown (10YR 5/4) sand; common medium distinct strong brown (7.5YR 5/6) mottles; single grain; loose; strongly acid; abrupt smooth boundary.
Cg—56 to 60 inches; grayish brown (10YR 5/2) sand that has thin strata of black (10YR 2/1) organic material; many coarse distinct very dark grayish brown (10YR 3/2) mottles; single grain; loose; slightly acid.

The solum ranges from 20 to 45 inches in thickness. It is very strongly acid to neutral.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 1 or 2. It is dominantly sand, but the range includes loamy sand and fine sand. Some pedons do not have an E horizon. The B horizon has hue of 5YR or 10YR, value of 2 to 5, and chroma of 2 to 6. It is sand, loamy sand, or fine sand. The content of ortstein in the B horizon ranges from 0 to 30 percent. The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 to 4. It is sand or fine sand. It is strongly acid to slightly acid.

Riddles Series

The Riddles series consists of well drained, moderately permeable soils formed in loamy and sandy till on till plains and moraines. Slope ranges from 1 to 12 percent.

These soils are taxadjuncts to the Riddles series because the subsoil has interfingering of albic material. This difference, however, does not significantly affect the usefulness or behavior of the soils.

Riddles soils are similar to Marlette soils and are commonly adjacent to Marlette and Ockley soils. Marlette soils have a substratum that is finer textured than that of the Riddles soils. Ockley soils have a gravelly sand substratum.

Typical pedon of Riddles loam, 1 to 6 percent slopes, 102 feet south and 660 feet west of the northeast corner of sec. 13, T. 4 N., R. 11 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loam; weak very fine subangular blocky structure; friable; common roots; about 1 percent pebbles and cobbles; neutral; abrupt smooth boundary.

B/E—8 to 18 inches; dark brown (7.5YR 4/4) clay loam (B); pale brown (10YR 6/3) sandy loam coatings (E) more than 2 millimeters thick on vertical faces of peds; moderate medium subangular blocky structure; firm; few roots; clay films on faces of some peds; about 1 percent pebbles and cobbles; medium acid; diffuse wavy boundary.

Bt1—18 to 37 inches; dark brown (7.5YR 4/4) clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few roots; clay films on faces of peds; about 1 percent pebbles and cobbles; strongly acid; gradual wavy boundary.

Bt2—37 to 45 inches; dark brown (7.5YR 4/4) clay loam; weak medium subangular blocky structure; firm; clay films on vertical faces of some peds; about 1 percent pebbles and cobbles; strongly acid; gradual wavy boundary.

Bt3—45 to 70 inches; dark brown (7.5YR 4/4) clay loam; weak medium subangular blocky structure; firm; about 1 percent pebbles and cobbles; strongly acid.

The solum ranges from 40 to 75 inches in thickness. It is strongly acid to neutral throughout. The content of pebbles and cobbles ranges from 1 to 10 percent throughout the pedon.

The Ap horizon has value of 3 or 4 and chroma of 2 or 3. It is dominantly loam, but the range includes silt loam and sandy loam. The E part of the B/E horizon has value of 5 or 6 and chroma of 2 to 4. It is sandy loam or loam. The B part of the B/E horizon and the Bt horizon have hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. They are loam, sandy clay loam, or clay loam. The 2C horizon, if it occurs, has value of 4 to 6 and chroma of 2 to 5. It is loamy sand, sandy loam, or sand.

Rimer Series

The Rimer series consists of somewhat poorly drained soils formed in sandy, loamy, and silty deposits on till plains, outwash plains, and lake plains. Permeability is rapid in the upper part of the pedon and very slow in the lower part. Slope ranges from 0 to 4 percent.

Rimer soils are similar to Wixom soils and are commonly adjacent to Blount, Capac, and Tedrow soils. The similar and adjacent soils are in positions on the landscape similar to those of the Rimer soils. Wixom soils have less clay in the substratum than the Rimer soils. They have a spodic horizon. Blount and Capac soils are finer textured in the upper part of the solum than the Rimer soils. Tedrow soils are sandy throughout.

Typical pedon of Rimer loamy sand, 0 to 4 percent slopes, 1,650 feet north and 165 feet west of the southeast corner of sec. 3, T. 3 N., R. 12 W.

Ap—0 to 11 inches; dark brown (10YR 3/3) loamy sand, brown (10YR 5/3) dry; weak medium subangular blocky structure; very friable; slightly acid; abrupt smooth boundary.

Bw—11 to 22 inches; yellowish brown (10YR 5/4) loamy sand; many medium distinct strong brown (7.5YR 5/6) and many medium faint brown (10YR 5/3) mottles; weak medium subangular blocky structure; very friable; slightly acid; abrupt smooth boundary.

Bt1—22 to 30 inches; dark yellowish brown (10YR 4/4) sandy loam; many fine faint yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; friable; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; neutral; clear smooth boundary.

Bt2—30 to 33 inches; dark brown (10YR 4/3) sandy loam; many fine faint grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

2Bt3—33 to 36 inches; brown (7.5YR 5/4) silty clay loam; many medium distinct light olive brown (2.5Y 5/6) and light brownish gray (2.5Y 6/2) mottles; weak coarse angular blocky structure; firm; thin continuous light brownish gray (2.5Y 6/2) clay films on faces of peds; mildly alkaline; clear smooth boundary.

2C—36 to 60 inches; brown (7.5YR 5/4) silty clay loam; many medium distinct light olive brown (2.5Y 5/6) and light brownish gray (2.5Y 6/2) mottles; weak coarse angular blocky structure; firm; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 26 to 46 inches. The thickness of the upper sandy material ranges from 22 to 30 inches. Reaction is neutral to strongly acid in the sandy part of the pedon and slightly acid to mildly alkaline in the loamy part.

The Ap horizon has value of 3 or 4 and chroma of 1 to 3. It is dominantly loamy sand, but the range includes loamy fine sand and fine sand. The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is loamy sand, loamy fine sand, or fine sand. The Bt horizon has hue of 10YR or 7.5YR and chroma of 3 or 4. It is fine sandy loam or sandy loam. The 2Bt and 2C horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 1 to 4. They are silty clay loam, silty clay, or clay loam. They are mildly alkaline or moderately alkaline.

Sebewa Series

The Sebewa series consists of poorly drained soils formed in loamy and sandy deposits on outwash plains, valley trains, and terraces. Permeability is moderate in the upper part of the pedon and rapid in the lower part. Slope is 0 to 2 percent.

Sebewa soils are similar to Brookston and Colwood soils and are commonly adjacent to Cohoctah,

Matherton, and Ockley soils. Brookston soils have a loamy substratum. Colwood soils have a stratified sandy, loamy, and silty substratum. Cohoctah soils are subject to flooding and are in the slightly lower positions on the landscape. Matherton soils are somewhat poorly drained and are in the slightly higher positions. Ockley soils are well drained and are on knolls and ridges.

Typical pedon of Sebewa loam, 2,510 feet north and 120 feet west of the southeast corner of sec. 14, T. 4 N., R. 11 W.

Ap—0 to 10 inches; black (10YR 2/1) loam, very dark grayish brown (10YR 3/2) dry; moderate fine subangular blocky structure; friable; common roots; about 4 percent pebbles and cobbles; slightly acid; abrupt smooth boundary.

Bg—10 to 14 inches; dark gray (10YR 4/1) sandy loam; few fine prominent dark yellowish brown (10YR 4/6) mottles; weak medium subangular blocky structure; friable; few roots; about 6 percent pebbles and cobbles; neutral; clear wavy boundary.

Btg—14 to 25 inches; grayish brown (2.5Y 5/2) clay loam; few fine prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few roots; clay films on faces of most peds; about 6 percent pebbles and cobbles; neutral; abrupt wavy boundary.

2C1—25 to 52 inches; brown (10YR 5/3) sand; common coarse faint grayish brown (10YR 5/2) mottles; single grain; loose; about 1 percent pebbles and cobbles; mildly alkaline; clear wavy boundary.

2C2—52 to 60 inches; yellowish brown (10YR 5/4) sand that has clay loam strata at a depth of 55 to 57 inches; single grain; loose; about 5 percent pebbles and cobbles; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 20 to 35 inches. The depth to free carbonates ranges from 25 to more than 60 inches. The content of pebbles and cobbles ranges from 1 to 20 percent in the solum and from 1 to 30 percent in the 2C horizon.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly loam, but the range includes sandy loam. The B horizon has value of 4 to 6. It is loam, sandy loam, sandy clay loam, or clay loam. The 2C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 4. It is dominantly gravelly sand, loamy sand, or sand. In some pedons, however, it has strata of finer textures.

Seward Series

The Seward series consists of moderately well drained soils formed in sandy, loamy, and silty material on moraines and till plains. Permeability is rapid in the upper part of the solum and slow in the lower part. Slope ranges from 1 to 6 percent.

Seward soils are commonly adjacent to Belleville, Covert, and Metea soils. Belleville soils are poorly drained and are in depressions and drainageways. Covert soils are not loamy in the lower part of the solum. They are in positions on the landscape similar to those of the Seward soils. Metea soils are well drained and are in the higher positions on the landscape.

Typical pedon of Seward loamy fine sand, 1 to 6 percent slopes, 1,000 feet east and 800 feet south of the northwest corner of sec. 33, T. 1 N., R. 15 W.

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) loamy fine sand, light brownish gray (10YR 6/2) dry; moderate medium granular structure; very friable; slightly acid; abrupt irregular boundary.

E—11 to 19 inches; brown (10YR 5/3) fine sand; massive; very friable; slightly acid; clear wavy boundary.

Bw1—19 to 30 inches; yellowish brown (10YR 5/4) loamy fine sand; few coarse faint dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; very friable; neutral; clear wavy boundary.

Bw2—30 to 39 inches; dark yellowish brown (10YR 4/4) sandy loam; common medium distinct pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

2Bt—39 to 43 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct dark yellowish brown (10YR 4/4) and light brownish gray (10YR 6/2) and common medium distinct gray (10YR 6/1) mottles; strong fine subangular blocky structure; firm; few faint dark grayish brown (2.5Y 4/2) clay films; mildly alkaline; gradual wavy boundary.

2C—43 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; many coarse distinct gray (10YR 6/1) and common fine distinct pale brown (10YR 6/3) mottles; massive; firm; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 39 to 46 inches. The thickness of the upper sandy material ranges from 22 to 32 inches. Reaction ranges from strongly acid to mildly alkaline in the solum and is mildly alkaline or moderately alkaline in the 2C horizon.

The Ap horizon has chroma of 2 or 3. It is dominantly loamy fine sand, but the range includes loamy sand. The E horizon has value of 5 or 6 and chroma of 3 to 6. It is loamy fine sand or sand. The Bw horizon has hue of 10YR or 7.5YR and value and chroma of 4 to 6. It is loamy fine sand or loamy sand. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is sandy loam or sandy clay loam. The 2Bt horizon has hue of 7.5YR or 2.5Y and value of 4 or 5. It is clay loam, silty clay loam, or silty clay. The 2C horizon also is clay loam, silty clay loam, or silty clay.

Sloan Series

The Sloan series consists of very poorly drained soils that formed in loamy and silty alluvium on flood plains. Permeability is moderate or moderately slow. Slope is 0 to 2 percent.

Sloan soils are commonly adjacent to Cohoctah and Glendora soils. Cohoctah soils are coarser textured than the Sloan soils. Glendora soils are sandy. They are in positions on the landscape similar to those of the Sloan soils.

Typical pedon of Sloan silt loam, 86 feet north and 1,980 feet west of the southeast corner of sec. 32, T. 3 N., R. 14 W.

A—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; moderate coarse granular structure; friable; common roots; mildly alkaline; abrupt wavy boundary.

Bg—10 to 26 inches; dark grayish brown (10YR 4/2) clay loam; many fine prominent dark yellowish brown (10YR 4/6) mottles; weak fine subangular blocky structure; friable; common roots; moderately alkaline; clear wavy boundary.

Cg1—26 to 34 inches; dark gray (10YR 4/1) clay loam; many medium prominent dark yellowish brown (10YR 4/6) mottles; massive; friable; few roots; slight effervescence; mildly alkaline; gradual wavy boundary.

Cg2—34 to 60 inches; dark greenish gray (5GY 4/1) very fine sandy loam that has thin strata of organic material; few coarse prominent olive (5Y 4/4) mottles; massive; very friable; strong effervescence; moderately alkaline.

The solum ranges from 20 to 35 inches in thickness. It is slightly acid to moderately alkaline.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is dominantly silt loam, but the range includes loam and clay loam. The B horizon has hue of 10YR or 2.5Y or is neutral in hue. It has value of 4 or 5 and chroma of 0 to 2. It is clay loam, silt loam, or loam. The C horizon has hue of 10YR, 2.5Y, or 5GY, value of 2 to 5, and chroma of 1 or 2. It is silty clay loam, clay loam, loam, silt loam, sandy loam, very fine sandy loam, or gravelly sandy loam.

Tedrow Series

The Tedrow series consists of somewhat poorly drained, rapidly permeable soils formed in sandy deposits on lake plains, outwash plains, and low sand dunes. Slope ranges from 0 to 4 percent.

Tedrow soils are similar to Algansee, Morocco, and Pipestone soils and are commonly adjacent to Granby and Oakville soils. Algansee soils are subject to rare flooding. Morocco soils are more acid in the solum than the Tedrow soils. Pipestone soils have a spodic horizon. Granby soils are poorly drained and are in depressions and drainageways. Oakville soils are well drained or moderately well drained and are in the higher positions on the landscape.

Typical pedon of Tedrow fine sand, 0 to 4 percent slopes, 578 feet south and 1,160 feet west of the northeast corner of sec. 9, T. 4 N., R. 14 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) fine sand, light brownish gray (10YR 6/2) dry; weak very fine granular structure; very friable; slightly acid; abrupt smooth boundary.

Bw1—10 to 14 inches; yellowish brown (10YR 5/6) loamy fine sand; few fine faint brownish yellow (10YR 6/6) mottles; weak fine subangular blocky structure; very friable; slightly acid; clear wavy boundary.

Bw2—14 to 22 inches; yellowish brown (10YR 5/4) fine sand; weak fine subangular blocky structure; very friable; slightly acid; clear wavy boundary.

Bw3—22 to 34 inches; brownish yellow (10YR 6/6) fine sand; few fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; very friable; slightly acid; clear wavy boundary.

C1—34 to 55 inches; light yellowish brown (10YR 6/4) fine sand; few fine faint grayish brown (10YR 5/2) mottles; single grain; loose; slightly acid; clear wavy boundary.

C2—55 to 60 inches; light yellowish brown (10YR 6/4) fine sand; few fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; single grain; loose; slightly acid.

The thickness of the solum ranges from 24 to 54 inches. Reaction is slightly acid or neutral throughout the pedon.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly fine sand, but the range includes loamy fine sand and loamy sand. The B horizon has value of 4 to 6 and chroma of 3 to 6. It is fine sand, sand, loamy sand, or loamy fine sand. The C horizon has value of 5 or 6 and chroma of 3 or 4. It is sand or fine sand.

Tekenink Series

The Tekenink series consists of well drained, moderately permeable soils formed in loamy glacial till on moraines. Slope ranges from 2 to 35 percent.

Tekenink soils are commonly adjacent to Marlette and Metea soils. Marlette soils are finer textured than the Tekenink soils. Metea soils are sandy to a depth of 20 to 40 inches and are underlain by loamy material. Marlette and Metea soils are in positions on the landscape similar to those of the Tekenink soils.

Typical pedon of Tekenink loamy fine sand, 2 to 6 percent slopes, 578 feet north and 940 feet east of the center of sec. 19, T. 1 N., R. 12 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) loamy fine sand, brown (10YR 5/3) dry; moderate fine granular structure; very friable; few very fine roots; about 3 percent pebbles and cobbles; slightly acid; abrupt smooth boundary.

B/E—10 to 15 inches; strong brown (7.5YR 5/6) sandy loam (Bt); pale brown (10YR 6/3) loamy fine sand coatings (E) on faces of peds; weak medium subangular blocky structure; friable; few very fine roots; about 3 percent pebbles and cobbles; slightly acid; clear irregular boundary.

Bt1—15 to 24 inches; brown (7.5YR 5/4) sandy loam; weak medium subangular blocky structure; friable; few very fine roots; about 3 percent pebbles and cobbles; neutral; clear irregular boundary.

Bt2—24 to 35 inches; brown (7.5YR 5/4) sandy loam; weak medium subangular blocky structure; friable; few very fine roots; about 3 percent pebbles and cobbles; few brown (7.5YR 5/4) thin clay films on faces of peds; medium acid; gradual wavy boundary.

Bt3—35 to 50 inches; brown (7.5YR 5/4) sandy loam; weak medium subangular blocky structure; friable; about 5 percent cobbles and pebbles; medium acid; gradual wavy boundary.

BC—50 to 60 inches; yellowish brown (10YR 5/4) sandy loam; weak medium subangular blocky structure; friable; about 3 percent cobbles and pebbles; medium acid.

The thickness of the solum and the depth to carbonates range from 45 to more than 60 inches. The content of pebbles and cobbles in the solum ranges from 0 to 15 percent. The solum is strongly acid to neutral.

The A horizon has value of 3 or 4 and chroma of 2 to 4. It is dominantly loamy fine sand, but the range includes loamy sand, sandy loam, and fine sandy loam. The B part of the B/E horizon has value of 4 or 5 and chroma of 3 to 6. It is sandy loam or fine sandy loam. The E part has value of 4 to 7 and chroma of 2 to 4. It is loamy fine sand or loamy sand. The Bt horizon has value of 4 or 5 and chroma of 4 to 6. It is sandy loam or fine sandy loam.

Thetford Series

The Thetford series consists of somewhat poorly drained, moderately rapidly permeable soils formed in sandy deposits on moraines, till plains, outwash plains, and lake plains. Slope ranges from 0 to 4 percent.

Thetford soils are commonly adjacent to Chelsea, Granby, and Oakville soils. Chelsea and Oakville soils are in the higher positions on the landscape. Chelsea soils are somewhat excessively drained. Oakville soils are moderately well drained or well drained. Granby soils are poorly drained and are in the lower positions on the landscape.

Typical pedon of Thetford loamy fine sand, 0 to 4 percent slopes, 100 feet north and 260 feet east of the southwest corner of sec. 3, T. 3 N., R. 12 W.

Ap—0 to 9 inches; very dark brown (10YR 2/2) loamy fine sand, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; very friable; common fine and very fine roots; slightly acid; abrupt smooth boundary.

E—9 to 17 inches; light yellowish brown (10YR 6/4) fine sand; few fine faint brownish yellow (10YR 6/6) mottles; weak medium subangular blocky structure; very friable; common very fine roots; medium acid; clear wavy boundary.

E&Bt—17 to 49 inches; pale brown (10YR 6/3) fine sand (E); many fine distinct strong brown (7.5YR 5/8) mottles; weak very fine subangular blocky structure; very friable; bands of yellowish brown (10YR 5/4) loamy fine sand and fine sandy loam (Bt); many fine faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; very friable; few very fine roots; wavy and discontinuous bands 0.5 inch to 3.0 inches thick, with a total thickness of about 8 inches; medium acid; clear wavy boundary.

C—49 to 60 inches; yellowish brown (10YR 5/4) fine sand; single grain; loose; neutral.

The solum ranges from 45 to more than 60 inches in thickness. It is medium acid to neutral.

The Ap horizon has value of 2 or 3 and chroma of 1 to 3. The A horizon is dominantly loamy fine sand, but the range includes loamy sand. The E horizon and the E part of the E&B horizon have value of 5 or 6 and chroma of 3 or 4. They are fine sand or loamy fine sand. The Bt part of the E&B horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 3 or 4. The C horizon has value of 5 or 6 and chroma of 1 to 4. It is fine sand or sand.

Wixom Series

The Wixom series consists of somewhat poorly drained soils formed in sandy and silty deposits on lake plains, till plains, and outwash plains. Permeability is rapid in the upper part of the pedon and moderately slow in the lower part. Slope ranges from 1 to 4 percent.

Wixom soils are similar to Rimer soils and are commonly adjacent to Belleville, Blount, Capac, and Metamora soils. Rimer soils do not have a spodic horizon. Belleville soils are poorly drained and are in depressions and drainageways. Blount, Capac, and Metamora soils are finer textured in the upper part of the subsoil than the Wixom soils. They are in positions on the landscape similar to those of the Wixom soils.

Typical pedon of Wixom loamy sand, in an area of Capac-Wixom complex, 1 to 4 percent slopes, 460 feet north and 2,580 feet east of the southwest corner of sec. 1, T. 4 N., R. 15 W.

Ap—0 to 9 inches; very dark brown (10YR 2/2) loamy sand, grayish brown (10YR 5/2) dry; very weak fine subangular blocky structure; very friable; many roots; about 1 percent pebbles; strongly acid; abrupt smooth boundary.

Bs1—9 to 17 inches; brown (7.5YR 4/4) loamy sand; common fine distinct strong brown (7.5YR 4/6) mottles; very weak very fine subangular blocky structure; very friable; common roots; about 1 percent pebbles; strongly acid; clear wavy boundary.

Bs2—17 to 24 inches; dark yellowish brown (10YR 4/6) sand; common coarse distinct dark reddish brown (5YR 3/4) mottles; single grain; loose; brittle in about 20 percent of the horizon; few roots; about 1 percent pebbles; medium acid; abrupt wavy boundary.

E—24 to 26 inches; light yellowish brown (10YR 6/4) sand; common medium prominent yellowish brown (10YR 5/8) mottles; single grain; loose; few roots; about 5 percent pebbles; slightly acid; abrupt wavy boundary.

Bt1—26 to 27 inches; dark yellowish brown (10YR 4/4) sandy loam; common fine distinct grayish brown (2.5Y 5/2) and strong brown (7.5YR 4/6) mottles; clay bridging between sand grains; weak fine subangular blocky structure; friable; few roots; about 3 percent pebbles; neutral; abrupt wavy boundary.

2Bt2—27 to 31 inches; yellowish brown (10YR 5/6) silty clay loam; many coarse prominent gray (5Y 5/1) mottles; light gray (5Y 6/1) coatings on faces of peds; weak medium platy structure parting to weak very fine subangular blocky; firm; about 3 percent pebbles and cobbles; neutral; clear wavy boundary.

2C—31 to 60 inches; brown (10YR 5/3) silty clay loam; many coarse prominent light gray (5Y 6/1) mottles; light gray (5Y 6/1) coatings on faces of peds; weak medium platy structure parting to weak fine subangular blocky; firm; about 3 percent pebbles and cobbles; strong effervescence; moderately alkaline.

The solum ranges from 20 to 40 inches in thickness. It is strongly acid to neutral. The depth to free carbonates and to the loamy 2C horizon is 25 to 40 inches.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly loamy sand, but the range includes sand. The Bs horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is sand or loamy sand. The 2Bt horizon has value of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silty clay loam, clay loam, sandy clay loam, or loam. The 2C horizon has value of 4 or 5 and chroma of 2 to 4. It is loam, clay loam, or silty clay loam.

Formation of the Soils

The paragraphs that follow relate the factors of soil formation to the soils in Allegan County and explain the processes of soil formation.

Factors of Soil Formation

Soil forms through the interaction of five major factors—the physical, chemical, and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the processes of soil formation have acted on the parent material (*5*).

Climate and plant and animal life are the active forces in soil formation. They slowly change the parent material into a natural body of soil that has genetically related layers, called horizons. The effects of climate and plant and animal life are conditioned by relief. The nature of the parent material affects the kind of soil profile that forms. In extreme cases, it determines the soil profile almost entirely. Finally, time is needed for changing the parent material into a soil. Some time is always needed for the differentiation of soil horizons.

The factors of soil formation are so closely interrelated in their effects on the soils that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. It determines the limits of the chemical and mineralogical composition of the soil. The parent materials of the soils in Allegan County were deposited by glaciers or by glacial meltwater. They were reworked and redeposited by subsequent actions of water and wind. The glaciers covered the county about 10,000 to 12,000 years ago. Although most of the parent materials are of common glacial origin, their properties vary greatly, sometimes within small areas, depending on how the materials were deposited. The dominant parent materials in Allegan County were deposited as glacial till, outwash, glaciolacustrine material, alluvium, and organic material.

Glacial till was deposited directly by glaciers with a minimum of water action. It is a mixture of particles of different sizes. The small pebbles in glacial till have sharp corners, indicating that they have not been worn by water. The glacial till in Allegan County is generally calcareous loamy sand, sandy loam, loam, silty clay loam, clay, or clay loam. Marlette and Tekenink soils are examples of soils that formed in glacial till.

Outwash material was deposited by running water from melting glaciers. The size of the particles depends on the speed of the stream that carried the material. When the water slowed down, the coarser particles were deposited. The finer particles, such as very fine sand, silt, and clay, were carried by slowly moving water. Outwash deposits generally occur as layers of particles of similar size, such as sandy loam, sand, gravel, or other coarse particles. Brady soils are an example of soils that formed in outwash deposits.

Glaciolacustrine material was deposited from still, or ponded, glacial meltwater. Because the coarser fragments dropped out of moving water as outwash, only the finer particles, such as very fine sand, silt, and clay, remained to settle out in still water. In Allegan County the soils that formed in lacustrine deposits are coarse textured to fine textured. Colwood soils are an example. They are on lake plains.

Alluvial material was recently deposited by floodwater from streams. This material has various textures, depending on the speed of the water from which it was deposited. Glendora soils are an example of soils that formed in alluvium.

Organic material consists of deposits of plant remains. After the glaciers withdrew from the area, water was left standing in depressions in the outwash plains, flood plains, moraines, and till plains. Grasses and sedges growing around the edges of these lakes died, and their residue fell to the bottom. Because the areas were wet, the plant remains did not decompose quickly. Later, water-tolerant trees grew in the areas. After these trees died, their residue became part of the organic accumulation. The lakes were eventually filled with organic material and developed into areas of muck. Houghton and Martisco soils formed in organic material.

Plant and Animal Life

Green plants have been the principal organisms that have influenced soil formation in Allegan County. Bacteria, fungi, earthworms, and human activities also have been important. The chief contribution of plant and animal life is the addition of organic matter and nitrogen

to the soil. The kind of organic material in the soil depends on the kinds of plants that grew on the soil in the past. The remains of these plants accumulated on the surface, decayed, and eventually became organic matter. The roots of the plants provided channels for the downward movement of water through the soil and added organic matter as they decayed. Bacteria in the soil help to break down the organic matter into plant nutrients.

The native vegetation in Allegan County was a mixture of deciduous and coniferous trees. Differences in natural soil drainage and variations in parent material affected the composition of the forest species. The well drained upland soils, such as Tekenink, Marlette, and Chelsea soils, were covered mainly by northern red oak, hickory, black walnut, sugar maple, and white pine. The wet soils were covered mainly by soft maple, yellow-poplar, aspen, cottonwood, elm, and ash. Examples are Newton and Brookston soils, which contain a considerable amount of organic matter.

Climate

Climate determines the kind of plant and animal life on and in the soil and the amount of water available for weathering minerals and for transporting soil material. Through its influence on soil temperature, climate also determines the rate of chemical reaction in the soil.

The climate in Allegan County is cool and humid. It is presumably similar to that under which the soils formed. The soils in Allegan County differ from soils that formed under a dry, warm climate and from those that formed under a moist, hot climate. The climate is generally uniform throughout the county. In the areas adjacent to Lake Michigan and in those a few miles inland, however, the date of the first frost in fall is later and the date of the last frost in spring is earlier because the lake warms up slowly in spring and cools slowly in fall. Only minor differences among the soils in the county are the result of differences in climate.

Relief

Relief has markedly affected the soils in Allegan County through its effect on natural drainage, runoff, erosion, plant cover, and soil temperature. The slope of the soils ranges from 0 to 45 percent. Runoff is most rapid on the steeper slopes. In low areas water is temporarily ponded.

The soils in the county range from excessively drained on the hilltops to very poorly drained in the depressions. Through its effect on soil aeration, drainage determines the color of the soil. Water and air move freely through well drained soils and slowly through very poorly drained soils. In Oakville and other soils that are well drained and well aerated, the iron and aluminum compounds that give most soils their color are brightly colored and oxidized. Granby and other soils that are poorly drained and poorly aerated are dull gray and mottled. The Oakville and Granby soils formed in similar kinds of parent material.

Time

Generally, a long time is needed for the development of distinct horizons. Differences in the length of time that the parent materials have been in place are commonly reflected in the degree of profile development. Some soils form rapidly. Others form slowly.

The soils in Allegan County range from young to mature. The glacial deposits in which many of the soils formed have been exposed to the soil-forming factors long enough for the development of distinct horizons. The soils that formed in recent alluvial sediment, however, have not been in place long enough for distinct horizons to develop. Glendora soils are an example of these young soils. Tekenink soils are an example of mature soils. Their horizons are distinct, and lime has been leached from their solum.

Processes of Soil Formation

The processes responsible for the development of the soil horizons in the unconsolidated parent material are referred to as soil genesis. The physical, chemical, and biological properties of the various soil horizons are referred to as soil morphology.

Several processes were involved in the development of horizons in the soils of Allegan County. These are the accumulation of organic matter, the leaching of lime (calcium carbonates) and other bases, the reduction and transfer of iron, and the formation and translocation of silicate clay minerals. In most of the soils, more than one of these processes have been active in the development of horizons.

As organic matter accumulates at the surface, an A horizon forms. This horizon is mixed into a plow layer, or Ap horizon, if the soil is plowed. In the soils of Allegan County, the surface layer ranges from high to low in organic matter content. Granby soils are an example of soils that have a high organic matter content in the surface layer. Oakville soils are an example of soils that have a low organic matter content.

The leaching of carbonates and other bases occurred in most of the soils. The leaching of bases generally precedes the translocation of silicate clay minerals. Many of the soils are moderately leached or strongly leached. For example, Tekenink soils are leached of carbonates to a depth of more than 60 inches, and Capac soils are leached to a depth of only 27 inches. The difference in the depth of leaching is a result of time, relief, and parent material.

Gleying, or the reduction and transfer of iron, is evident in the somewhat poorly drained, poorly drained, and very poorly drained soils. A gray color in the subsoil indicates the reduction and loss of iron. Pewamo soils are an example of strongly gleyed soils.

The translocation of clay minerals contributes to horizon development. An eluviated, or leached, E horizon has platy structure, is lower in content of clay than the illuviated B horizon, and typically is lighter in color. The B horizon typically has an accumulation of clay, or clay films, in pores and on the faces of peds. Soils at this stage of formation were probably leached of carbonates and soluble salts to a considerable extent before the translocation of silicate clay took place. Marlette soils are an example.

In some soils, iron, aluminum, and humus have moved from the surface layer to the B horizon. As a result, the B horizon in these soils is brown. Pipestone soils are an example.

References

(1) American Association of State Highway and Transportation Officials. 1982. Standard specifications for highway materials and methods of sampling and testing. Ed. 13, 2 vols., illus.

(2) American Society for Testing and Materials. 1986. Standard test method for classification of soils for engineering purposes. ASTM Stand. D 2487.

(3) Biggs, C. H. 1938. Geology of Allegan County, Michigan. State of Mich., Dept. of Conserv., Geol. Surv., Prog. Rep. 4. 57 pp.

(4) Fippin, Elmer O., and Thomas D. Rice. 1901. Soil Survey of Allegan County, Michigan. U.S. Dep. Agric., Bur. of Soils. 124 pp., illus.

(5) Jenny, Hans. 1941. Factors of soil formation. McGraw-Hill Book Company, Inc., 281 pp., illus.

(6) Michigan Agricultural Reporting Service, Michigan Department of Agriculture. 1982. Michigan agricultural statistics. 80 pp.

(7) Michigan State University. 1980. Fertilizer recommendations for vegetables and field crops in Michigan. Ext. Bull. E-550, 24 pp.

(8) Mokma, D. L., E. P. Whiteside, and I. F. Schneider. 1978. Soil management units and land use planning. Mich. Ext. Bull. E-1262. 12 pp.

(9) Piwowar, Thaddeus S. 1968. Potentials for outdoor recreation development—Allegan County, Michigan. 70 pp.

(10) Soil Science Society of America and American Society of Agronomy. 1966. Soil surveys and land use planning. 196 pp., illus.

(11) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus.

(12) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210, 21 pp.

(13) United States Department of Agriculture. 1975. Analysis of wildlife habitat. Tech. Pap. 3. 19 pp.

(14) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

(15) United States Department of Commerce, Bureau of the Census. 1976. 1974 census of agriculture (preliminary report)—Allegan County, Michigan. Publ. 26-005, 4 pp.

Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly

continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material).

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

Pressurized sewage disposal system. A system of evenly distributing secondary effluent from a holding tank to a stone-filled filter bed. The effluent is distributed under low pressure through small-diameter subsurface pipes that have small, evenly spaced holes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirments for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multipled by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide

range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-80 at Allegan, Michigan]

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	30.8	15.8	23.3	56	-11	0	2.59	1.5	3.6	8	25.8
February---	34.2	16.1	25.1	56	-11	0	1.69	.9	2.4	5	13.3
March------	43.7	25.4	34.5	74	1	12	2.70	1.5	3.7	7	9.4
April------	58.5	36.3	47.4	83	17	94	3.37	2.4	4.3	8	2.1
May--------	70.6	46.2	58.4	90	28	295	2.93	1.8	4.0	7	.0
June-------	79.6	55.5	67.6	95	37	535	3.90	2.2	5.4	7	.0
July-------	83.5	59.6	71.5	96	44	675	3.21	2.0	4.3	6	.0
August-----	81.6	57.8	69.7	94	41	618	3.34	1.8	4.7	7	.0
September--	74.7	50.6	62.6	92	32	391	3.24	1.1	5.0	7	.0
October----	62.9	40.3	51.6	84	22	144	2.89	1.4	4.2	7	.7
November---	48.0	31.4	39.7	73	12	23	2.99	1.9	4.0	8	8.6
December---	35.7	21.5	28.6	60	-5	0	2.86	1.7	3.9	8	19.9
Year----	58.6	38.0	48.3	97	-14	2,787	35.70	30.5	40.7	84	79.7

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-80 at Allegan, Michigan]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 23	May 6	May 21
2 years in 10 later than--	Apr. 18	May 1	May 24
5 years in 10 later than--	Apr. 8	Apr. 22	May 6
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 20	Oct. 10	Sept. 23
2 years in 10 earlier than--	Oct. 25	Oct. 15	Sept. 28
5 years in 10 earlier than--	Nov. 6	Oct. 26	Oct. 7

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-80 at Allegan, Michigan]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	187	166	133
8 years in 10	196	173	140
5 years in 10	212	186	153
2 years in 10	228	199	166
1 year in 10	236	205	173

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
2	Glendora loamy sand	10,170	1.9
4	Dune land and Beaches	1,090	0.2
5	Houghton muck	15,205	2.8
6	Adrian muck	7,155	1.3
7	Palms muck	2,085	0.4
8B	Glynwood clay loam, 1 to 6 percent slopes	3,670	0.7
8C	Glynwood clay loam, 6 to 12 percent slopes	2,310	0.4
10B	Oakville fine sand, 0 to 6 percent slopes	84,350	15.8
10C	Oakville fine sand, 6 to 18 percent slopes	14,520	2.7
10E	Oakville fine sand, 18 to 45 percent slopes	3,005	0.6
11B	Oshtemo-Chelsea complex, 0 to 6 percent slopes	19,300	3.7
11C	Oshtemo-Chelsea complex, 6 to 12 percent slopes	8,590	1.6
11D	Oshtemo-Chelsea complex, 12 to 18 percent slopes	5,785	1.1
11E	Oshtemo-Chelsea complex, 18 to 35 percent slopes	1,465	0.3
12B	Ockley loam, 1 to 6 percent slopes	11,870	2.2
12C	Ockley loam, 6 to 12 percent slopes	6,795	1.3
12D	Ockley loam, 12 to 18 percent slopes	3,000	0.6
12E	Ockley loam, 18 to 30 percent slopes	1,095	0.2
14C	Marlette loam, 6 to 12 percent slopes	7,035	1.3
14D	Marlette loam, 12 to 18 percent slopes	3,015	0.6
14E	Marlette loam, 18 to 35 percent slopes	1,860	0.3
15B	Morocco-Newton complex, 0 to 3 percent slopes	8,800	1.6
16B	Capac loam, 0 to 6 percent slopes	27,455	5.2
17	Brookston loam	3,080	0.6
18	Pits	795	0.1
19A	Brady sandy loam, 0 to 3 percent slopes	6,535	1.2
21B	Capac-Wixom complex, 1 to 4 percent slopes	8,070	1.5
22A	Matherton loam, 0 to 3 percent slopes	2,480	0.5
23	Sebewa loam	5,140	1.0
26A	Pipestone sand, 0 to 4 percent slopes	8,590	1.6
27B	Metea loamy fine sand, 1 to 6 percent slopes	8,910	1.7
27C	Metea loamy fine sand, 6 to 12 percent slopes	2,935	0.5
28A	Rimer loamy sand, 0 to 4 percent slopes	15,730	2.9
29	Cohoctah silt loam	7,615	1.4
30	Colwood silt loam	7,040	1.3
31B	Tekenink loamy fine sand, 2 to 6 percent slopes	3,250	0.6
31C	Tekenink loamy fine sand, 6 to 12 percent slopes	2,035	0.4
31D	Tekenink loamy fine sand, 12 to 18 percent slopes	640	0.1
31E	Tekenink loamy fine sand, 18 to 35 percent slopes	495	0.1
33A	Kibbie fine sandy loam, 0 to 3 percent slopes	5,785	1.1
34	Aquents, sandy and loamy	1,075	0.2
36	Corunna sandy loam	1,970	0.4
39	Granby loamy sand	13,065	2.4
41B	Blount silt loam, 1 to 4 percent slopes	30,900	5.8
42B	Metamora sandy loam, 1 to 4 percent slopes	5,235	1.0
44B	Chelsea loamy fine sand, 0 to 6 percent slopes	34,195	6.4
44C	Chelsea loamy fine sand, 6 to 12 percent slopes	4,960	0.9
44D	Chelsea loamy fine sand, 12 to 18 percent slopes	1,675	0.3
44E	Chelsea loamy fine sand , 18 to 30 percent slopes	695	0.1
45	Pewamo silt loam	5,675	1.1
47	Napoleon muck	695	0.1
48	Belleville loamy sand	2,215	0.4
49A	Tedrow fine sand, 0 to 4 percent slopes	9,155	1.7
50	Aquents and Histosols, ponded	7,160	1.3
51A	Thetford loamy fine sand, 0 to 4 percent slopes	9,270	1.7
53B	Oakville fine sand, loamy substratum, 0 to 6 percent slopes	3,450	0.6
57A	Covert sand, 0 to 4 percent slopes	6,155	1.1
60B	Seward loamy fine sand, 1 to 6 percent slopes	2,535	0.5
62	Sloan silt loam	2,700	0.5
63B	Riddles loam, 1 to 6 percent slopes	3,305	0.6
63C	Riddles loam, 6 to 12 percent slopes	1,100	0.2
64	Belleville-Brookston complex	1,990	0.4
65	Cohoctah silt loam, protected	1,765	0.3
66	Udipsamments, nearly level to gently sloping	1,005	0.2
67	Martisco muck	1,285	0.2

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
69	Newton mucky fine sand	3,795	0.7
70A	Morocco fine sand, 0 to 3 percent slopes	7,870	1.5
72B	Urban land-Oakville complex, 0 to 6 percent slopes	4,065	0.8
73A	Algansee loamy sand, protected, 0 to 3 percent slopes	2,660	0.5
74	Glendora loamy sand, protected	5,070	0.9
75B	Marlette-Capac loams, 1 to 6 percent slopes	11,670	2.2
	Water areas less than 40 acres in size	5,402	1.0
	Water areas greater than 40 acres in size	3,168	0.6
	Total	535,680	100.0

TABLE 5.--PRIME FARMLAND

[Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name]

Map symbol	Soil name
8B	Glynwood clay loam, 1 to 6 percent slopes
12B	Ockley loam, 1 to 6 percent slopes
16B	Capac loam, 0 to 6 percent slopes (where drained)
17	Brookston loam (where drained)
19A	Brady sandy loam, 0 to 3 percent slopes
21B	Capac-Wixom complex, 1 to 4 percent slopes (where drained)
22A	Matherton loam, 0 to 3 percent slopes (where drained)
23	Sebewa loam (where drained)
27B	Metea loamy fine sand, 1 to 6 percent slopes
29	Cohoctah silt loam (where drained and either protected from flooding or not frequently flooded during the growing season)
30	Colwood silt loam (where drained)
31B	Tekenink loamy fine sand, 2 to 6 percent slopes
33A	Kibbie fine sandy loam, 0 to 3 percent slopes
36	Corunna sandy loam (where drained)
41B	Blount silt loam, 1 to 4 percent slopes (where drained)
42B	Metamora sandy loam, 1 to 4 percent slopes (where drained)
45	Pewamo silt loam (where drained)
62	Sloan silt loam (where drained and either protected from flooding or not frequently flooded during the growing season)
63B	Riddles loam, 1 to 6 percent slopes
65	Cohoctah silt loam, protected (where drained)
75B	Marlette-Capac loams, 1 to 6 percent slopes

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF FIELD CROPS

[Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Land capability		Corn		Corn silage		Soybeans		Winter wheat		Oats		Grass-legume hay	
	N	I	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Tons	Tons	Bu	Bu	Bu	Bu	Bu	Bu	Tons	Tons
2 Glendora	VIw	---	---	---	---	---	---	---	---	---	---	---	---	---
4*. Dune land and Beaches														
5 Houghton	IIIw	---	115	---	20	---	34	---	---	---	---	---	---	---
6 Adrian	IVw	---	100	---	15	---	23	---	---	---	---	---	---	---
7 Palms	IIIw	---	105	---	17	---	42	---	---	---	65	---	---	---
8B Glynwood	IIe	---	105	---	17	---	35	---	40	---	75	---	4.5	---
8C Glynwood	IIIe	---	90	---	13	---	30	---	40	---	75	---	4.0	---
10B Oakville	IVs	IIIe	50	160	8	21	---	---	24	---	45	---	2.5	---
10C Oakville	VIs	---	---	---	---	---	---	---	---	---	---	---	2.0	---
10E Oakville	VIIs	---	---	---	---	---	---	---	---	---	---	---	---	---
11B Oshtemo-Chelsea	IIIs	IIIe	75	165	12	---	26	---	30	---	61	---	3.5	---
11C Oshtemo-Chelsea	IIIe	---	70	---	11	---	24	---	28	---	61	---	2.2	---
11D Oshtemo-Chelsea	VIe	---	---	---	---	---	---	---	---	---	---	---	1.8	---
11E Oshtemo-Chelsea	VIIe	---	---	---	---	---	---	---	---	---	---	---	---	---
12B Ockley	IIe	IIe	100	175	15	27	35	55	44	---	80	---	4.0	6.5
12C Ockley	IIIe	---	90	---	14	---	30	---	40	---	70	---	3.5	6.0
12D Ockley	IVe	---	70	---	12	---	25	---	30	---	60	---	3.0	---
12E Ockley	VIe	---	---	---	---	---	---	---	---	---	---	---	---	---
14C Marlette	IIIe	IIIe	100	150	14	25	---	---	56	---	75	---	3.5	7.5

See footnote at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF FIELD CROPS--Continued

Soil name and map symbol	Land capability		Corn		Corn silage		Soybeans		Winter wheat		Oats		Grass-legume hay	
	N	I	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Tons	Tons	Bu	Bu	Bu	Bu	Bu	Bu	Tons	Tons
14D------------- Marlette	IVe	---	70	---	12	---	---	---	40	---	55	---	3.2	---
14E------------- Marlette	VIIe	---	---	---	---	---	---	---	---	---	---	---	---	---
15B------------- Morocco-Newton	IVw	---	80	---	12	---	31	---	40	---	---	---	3.0	---
16B------------- Capac	IIe	IIe	120	155	17	26	45	---	62	---	95	---	5.0	6.8
17-------------- Brookston	IIw	---	145	---	20	---	51	---	65	---	110	---	5.5	---
18*. Pits														
19A------------- Brady	IIw	---	105	---	16	---	32	---	50	---	90	---	4.0	---
21B------------- Capac-Wixom	IIw	IIw	105	154	17	26	40	---	50	---	90	---	4.5	6.9
22A------------- Matherton	IIw	---	105	---	17	---	36	---	45	---	80	---	3.7	---
23-------------- Sebewa	IIw	---	105	---	17	---	40	---	50	---	90	---	4.6	---
26A------------- Pipestone	IVw	IVw	60	130	12	22	---	---	30	---	60	---	3.0	5.5
27B------------- Metea	IIIe	IIIe	85	175	14	23	30	55	42	---	75	---	4.0	7.0
27C------------- Metea	IIIe	---	75	---	11	---	26	---	38	---	65	---	3.5	6.5
28A------------- Rimer	IIe	---	90	---	13	---	38	---	46	---	72	---	4.0	---
29-------------- Cohoctah	Vw	---	---	---	---	---	---	---	---	---	---	---	---	---
30-------------- Colwood	IIw	---	130	---	20	---	45	---	65	---	110	---	5.5	---
31B------------- Tekenink	IIe	IIe	90	160	15	26	35	55	40	---	55	---	4.0	6.8
31C------------- Tekenink	IIIe	---	80	---	14	---	32	---	35	---	45	---	3.6	6.5
31D------------- Tekenink	IVe	---	70	---	13	---	30	---	32	---	40	---	3.2	---
31E------------- Tekenink	VIIe	---	---	---	---	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF FIELD CROPS--Continued

Soil name and map symbol	Land capability		Corn		Corn silage		Soybeans		Winter wheat		Oats		Grass-legume hay	
	N	I	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Tons	Tons	Bu	Bu	Bu	Bu	Bu	Bu	Tons	Tons
33A Kibbie	IIw	---	120	---	18	---	40	---	65	---	100	---	4.5	---
34. Aquents														
36 Corunna	IIw	---	120	---	18	---	40	---	65	---	100	---	4.5	---
39 Granby	IVw	---	80	---	12	---	30	---	35	---	55	---	---	---
41B Blount	IIe	---	105	---	16	---	35	---	47	---	80	---	4.3	---
42B Metamora	IIe	---	110	---	17	---	36	---	60	---	95	---	3.5	---
44B Chelsea	IVs	IIIe	68	160	10	22	25	45	30	---	45	---	3.0	6.0
44C Chelsea	VIs	---	---	---	---	---	---	---	---	---	---	---	2.3	5.5
44D Chelsea	VIIs	---	---	---	---	---	---	---	---	---	---	---	---	---
44E Chelsea	VIIs	---	---	---	---	---	---	---	---	---	---	---	---	---
45 Pewamo	IIw	---	125	---	19	---	42	---	60	---	100	---	5.0	---
47 Napoleon	VIw	---	---	---	---	---	---	---	---	---	---	---	---	---
48 Belleville	IIIw	---	105	---	17	---	35	---	50	---	85	---	4.2	---
49A Tedrow	IIIs	---	85	---	14	---	30	---	35	---	65	---	3.2	---
50 Aquents and Histosols	VIIIw	---	---	---	---	---	---	---	---	---	---	---	---	---
51A Thetford	IIIw	IIIw	80	140	12	22	30	---	35	---	60	---	3.0	6.5
53B Oakville	IIIs	IIIe	65	155	12	22	25	50	32	---	60	---	3.5	6.0
57A Covert	IVs	---	---	---	---	---	38	---	46	---	72	---	4.0	---
60B Seward	IIe	---	90	---	15	---	30	---	34	---	75	---	3.5	6.5
62 Sloan	IIIw	---	110	---	18	---	35	---	40	---	65	---	5.0	---

See footnote at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF FIELD CROPS--Continued

Soil name and map symbol	Land capability		Corn		Corn silage		Soybeans		Winter wheat		Oats		Grass-legume hay	
	N	I	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Tons	Tons	Bu	Bu	Bu	Bu	Bu	Bu	Tons	Tons
63B------------- Riddles	IIe	IIe	115	170	18	27	40	---	46	---	85	---	4.0	6.5
63C------------- Riddles	IIIe	---	105	---	17	---	37	---	42	---	---	---	3.4	---
64-------------- Belleville-Brookston	IIIw	---	121	---	18	---	42	---	57	---	100	---	4.5	---
65-------------- Cohoctah	IIw	---	100	---	16	---	45	---	40	---	75	---	4.5	---
66. Udipsamments														
67-------------- Martisco	IVw	---	80	---	16	---	---	---	---	---	---	---	---	---
69-------------- Newton	Vw	---	---	---	---	---	---	---	---	---	---	---	---	---
70A------------- Morocco	IVs	---	75	---	11	---	25	---	36	---	45	---	2.6	---
72B*. Urban land-Oakville														
73A------------- Algansee	IIIw	---	75	---	13	---	35	---	35	---	65	---	3.5	---
74-------------- Glendora	IIIw	---	80	---	14	---	35	---	40	---	65	---	3.5	---
75B------------- Marlette-Capac	IIe	IIe	110	157	18	27	---	---	61	---	85	---	4.3	7.4

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF SPECIALTY CROPS

[Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Land capability		Apples		Blueberries		Cherries		Peaches		Irish potatoes		Asparagus	
	N	I	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Lbs	Lbs	Tons	Tons	Bu	Bu	Cwt	Cwt	Crates	Crates
2-------------- Glendora	VIw	---	---	---	---	---	---	---	---	---	---	---	---	---
4*. Dune land and Beaches														
5-------------- Houghton	IIIw	---	---	---	6,000	---	---	---	---	---	250	360	---	---
6-------------- Adrian	IVw	---	---	---	6,000	---	---	---	---	---	230	360	15	---
7-------------- Palms	IIIw	---	---	---	---	---	---	---	---	---	---	---	15	---
8B------------- Glynwood	IIe	---	400	---	---	---	---	---	---	---	---	---	---	---
8C------------- Glynwood	IIIe	---	400	---	---	---	---	---	---	---	---	---	---	---
10B------------ Oakville	IVs	IIIe	---	---	---	---	3	5	150	350	125	300	13	---
10C------------ Oakville	VIs	---	---	---	---	---	---	---	150	350	---	---	---	---
10E------------ Oakville	VIIs	---	---	---	---	---	---	---	---	---	---	---	---	---
11B------------ Oshtemo-Chelsea	IIIs	IIIe	450	---	---	---	3	5	230	375	220	350	20	---
11C------------ Oshtemo-Chelsea	IIIe	---	450	---	---	---	3	5	230	375	---	---	---	---
11D------------ Oshtemo-Chelsea	VIe	---	---	---	---	---	---	---	---	---	---	---	---	---
11E------------ Oshtemo-Chelsea	VIIe	---	---	---	---	---	---	---	---	---	---	---	---	---
12B------------ Ockley	IIe	---	600	---	---	---	5	7	400	500	210	270	13	---
12C------------ Ockley	IIIe	---	600	---	---	---	5	7	400	500	---	---	---	---
12D------------ Ockley	IVe	---	---	---	---	---	---	---	---	---	---	---	---	---
12E------------ Ockley	VIe	---	---	---	---	---	---	---	---	---	---	---	---	---
14C------------ Marlette	IIIe	IIIe	---	---	---	---	5	7	400	500	---	---	---	---

See footnote at end of table.

TABLE 7.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF SPECIALTY CROPS--Continued

Soil name and map symbol	Land capability		Apples		Blueberries		Cherries		Peaches		Irish potatoes		Asparagus	
	N	I	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Lbs	Lbs	Tons	Tons	Bu	Bu	Cwt	Cwt	Crates	Crates
14D------------- Marlette	IVe	---	---	---	---	---	---	---	---	---	---	---	---	---
14E------------- Marlette	VIIe	---	---	---	---	---	---	---	---	---	---	---	---	---
15B------------- Morocco-Newton	IVw	---	---	---	6,000	---	---	---	---	---	---	---	---	---
16B------------- Capac	IIe	IIe	350	---	---	---	---	---	---	---	---	---	---	---
17-------------- Brookston	IIw	---	---	---	---	---	---	---	---	---	---	---	---	---
18*. Pits														
19A------------- Brady	IIw	---	300	---	---	---	---	---	---	---	150	300	20	---
21B------------- Capac-Wixom	IIw	IIw	300	---	---	---	---	---	---	---	---	---	---	---
22A------------- Matherton	IIw	---	350	---	---	---	4	6	---	---	---	---	---	---
23-------------- Sebewa	IIw	---	---	---	---	---	---	---	---	---	---	---	---	---
26A------------- Pipestone	IVw	IVw	---	---	6,000	---	---	---	---	---	---	---	---	---
27B------------- Metea	IIIe	IIIe	400	---	---	---	3	5	200	300	250	375	25	---
27C------------- Metea	IIIe	---	400	---	---	---	3	5	200	300	---	---	---	---
28A------------- Rimer	IIe	---	300	---	5,000	---	---	---	---	---	300	375	15	---
29-------------- Cohoctah	Vw	---	---	---	---	---	---	---	---	---	---	---	---	---
30-------------- Colwood	IIw	---	---	---	---	---	---	---	---	---	---	---	---	---
31B------------- Tekenink	IIe	IIe	475	---	---	---	5	7	400	500	300	375	35	---
31C------------- Tekenink	IIIe	---	475	---	---	---	5	7	350	450	---	---	---	---
31D------------- Tekenink	IVe	---	450	---	---	---	---	---	---	---	---	---	---	---
31E------------- Tekenink	VIIe	---	---	---	---	---	---	---	---	---	---	---	---	---
33A------------- Kibbie	IIw	---	400	---	---	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 7.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF SPECIALTY CROPS--Continued

Soil name and map symbol	Land capability		Apples		Blueberries		Cherries		Peaches		Irish potatoes		Asparagus	
	N	I	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Lbs	Lbs	Tons	Tons	Bu	Bu	Cwt	Cwt	Crates	Crates
34. Aquents														
36 Corunna	IIw	---	---	---	---	---	---	---	---	---	---	---	---	---
39 Granby	IVw	---	---	---	5,000	---	---	---	---	---	225	360	---	---
41B Blount	IIe	---	300	---	---	---	---	---	---	---	---	---	---	---
42B Metamora	IIe	---	350	---	---	---	---	---	---	---	---	---	15	---
44B Chelsea	IVs	IIIe	---	---	---	---	3	5	160	360	140	300	14	---
44C Chelsea	VIs	---	---	---	---	---	3	5	160	360	140	300	---	---
44D Chelsea	VIIs	---	---	---	---	---	---	---	---	---	---	---	---	---
44E Chelsea	VIIs	---	---	---	---	---	---	---	---	---	---	---	---	---
45 Pewamo	IIw	---	---	---	---	---	---	---	---	---	---	---	---	---
47 Napoleon	VIw	---	---	---	7,000	---	---	---	---	---	250	360	---	---
48 Belleville	IIIw	---	---	---	5,000	---	---	---	---	---	---	---	---	---
49A Tedrow	IIIs	---	---	---	5,000	---	---	---	---	---	---	---	12	---
50 Aquents and Histosols	VIIIw	---	---	---	---	---	---	---	---	---	---	---	---	---
51A Thetford	IIIw	IIIw	350	---	5,000	---	---	---	---	---	300	375	15	---
53B Oakville	IIIs	IIIe	250	---	---	---	3	5	150	350	150	300	18	---
57A Covert	IVs	---	---	---	6,000	---	---	---	---	---	---	---	---	---
60B Seward	IIe	---	350	---	5,000	---	---	---	---	---	300	375	20	---
62 Sloan	IIIw	---	---	---	---	---	---	---	---	---	---	---	---	---
63B Riddles	IIe	IIe	500	---	---	---	5	7	400	500	210	270	30	---

See footnote at end of table.

TABLE 7.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF SPECIALTY CROPS--Continued

Soil name and map symbol	Land capability		Apples		Blueberries		Cherries		Peaches		Irish potatoes		Asparagus	
	N	I	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Lbs	Lbs	Tons	Tons	Bu	Bu	Cwt	Cwt	Crates	Crates
63C------------- Riddles	IIIe	---	500	---	---	---	5	7	375	500	---	---	---	---
64-------------- Belleville-Brookston	IIIw	---	---	---	---	---	---	---	---	---	---	---	---	---
65-------------- Cohoctah	IIw	---	---	---	---	---	---	---	---	---	230	360	---	---
66. Udipsamments														
67-------------- Martisco	IVw	---	---	---	---	---	---	---	---	---	---	---	20	---
69-------------- Newton	Vw	---	---	---	7,000	---	---	---	---	---	---	---	---	---
70A------------- Morocco	IVs	---	---	---	5,000	---	---	---	---	---	---	---	12	---
72B*. Urban land-Oakville														
73A------------- Algansee	IIIw	---	---	---	---	---	---	---	---	---	140	300	---	---
74-------------- Glendora	IIIw	---	---	---	---	---	---	---	---	---	225	360	---	---
75B------------- Marlette-Capac	IIe	IIe	500	---	---	---	4	6	350	450	210	270	13	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	---	---	---	---	---
II	163,160	99,890	63,270	---	---
III	112,810	39,710	41,195	31,905	---
IV	178,120	6,655	46,765	124,700	---
V	11,410	---	11,410	---	---
VI	37,225	6,880	10,865	19,480	---
VII	9,195	3,820	---	5,375	---
VIII	---	---	---	---	---

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that inform available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume	Tr
								cf/ac/yr	
2 Glendora	3w	Slight	Severe	Moderate	Severe	Silver maple	90	42	Easter white north Norwa
						Red maple	65	40	
						Swamp white oak	---	---	
						Quaking aspen	---	---	
						Black ash	---	---	
						Eastern cottonwood	---	---	
						White ash	65	63	
5 Houghton	2w	Slight	Severe	Severe	Severe	Red maple	56	36	
						Silver maple	82	36	
						White ash	56	40	
						Quaking aspen	60	64	
						Tamarack	45	35	
						Green ash	---	---	
						Northern white-cedar	27	39	
6 Adrian	2w	Slight	Severe	Severe	Severe	Silver maple	78	32	
						Red maple	53	34	
						White ash	69	73	
						Quaking aspen	60	64	
						Tamarack	45	35	
						Green ash	69	73	
7 Palms	2w	Slight	Severe	Severe	Severe	Red maple	55	35	
						Silver maple	---	---	
						White ash	---	---	
						Quaking aspen	---	---	
						Northern white-cedar	---	---	
						Tamarack	---	---	
						Black ash	---	---	
8B, 8C Glynwood	3c	Slight	Moderate	Moderate	Moderate	Northern red oak	55	38	Easter yello
						Red maple	55	35	
						White ash	55	38	
						American beech	---	---	
						American basswood	---	---	
10B, 10C Oakville	3s	Slight	Moderate	Severe	Slight	Northern red oak	67	49	Red p white
						Red pine	---	---	
						White oak	---	---	
						Bigtooth aspen	74	86	
						Black oak	---	---	
						Eastern white pine	---	---	

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume	T
								cf/ac/yr	
10E---------------- Oakville	3r	Moderate	Severe	Severe	Slight	Northern red oak----	67	49	Red p
						Red pine------------	---	---	whit
						White oak-----------	---	---	
						Bigtooth aspen------	74	86	
						Black oak-----------	---	---	
						Eastern white pine--	---	---	
11B*, 11C*:									
Oshtemo------------	3s	Slight	Slight	Moderate	Slight	Northern red oak----	66	48	Easte
						White oak-----------	---	---	red
						American basswood---	66	48	spru
						Sugar maple---------	61	38	spru
									Caro
Chelsea------------	4s	Slight	Slight	Moderate	Slight	White oak-----------	70	52	Easte
						Red pine------------	72	128	red
						Eastern white pine--	83	190	
						Jack pine-----------	70	106	
						Quaking aspen-------	72	84	
						Northern red oak----	70	52	
11D*:									
Oshtemo------------	3s	Slight	Slight	Moderate	Slight	Northern red oak----	66	48	Easte
						White oak-----------	---	---	red
						American basswood---	66	41	spru
						Sugar maple---------	61	38	spru
									Caro
Chelsea------------	4s	Slight	Slight	Moderate	Slight	White oak-----------	70	52	Easte
						Red pine------------	72	128	red
						Eastern white pine--	83	190	
						Jack pine-----------	70	106	
						Quaking aspen-------	72	84	
						Northern red oak----	70	52	
11E*:									
Oshtemo------------	3r	Moderate	Moderate	Moderate	Slight	Northern red oak----	66	48	Easte
						White oak-----------	---	---	red
						American basswood---	66	41	spru
						Sugar maple---------	61	38	spru
									Caro
Chelsea------------	4r	Moderate	Severe	Moderate	Slight	White oak-----------	70	52	Easte
						Red pine------------	72	128	red
						Eastern white pine--	83	190	
						Jack pine-----------	70	106	
						Quaking aspen-------	72	84	
						Northern red oak----	70	52	

See footnote at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume	T
								cf/ac/ yr	
12B, 12C, 12D------ Ockley	7a	Slight	Slight	Slight	Slight	Quaking aspen-------	80	94	Easte
						Bitternut hickory---	---	---	red
						Red maple-----------	---	---	popl
						Northern red oak----	---	---	impe
						White ash-----------	---	---	popl
						White oak-----------	---	---	
12E--------------- Ockley	7r	Moderate	Moderate	Slight	Slight	Quaking aspen-------	80	94	Easte
						Bitternut hickory---	---	---	red
						Red maple-----------	---	---	popl
						Northern red oak----	---	---	impe
						White ash-----------	---	---	popl
						White oak-----------	---	---	
14C, 14D---------- Marlette	3a	Slight	Slight	Slight	Slight	Sugar maple---------	65	40	Black
						Northern red oak----	69	51	whit
						White ash-----------	---	---	
						Black walnut--------	---	---	
						American basswood---	---	---	
						Black cherry--------	---	---	
						White oak-----------	---	---	
14E--------------- Marlette	3r	Moderate	Moderate	Slight	Slight	Sugar maple---------	65	40	Black
						Northern red oak----	69	51	whit
						White ash-----------	---	---	
						Black walnut--------	---	---	
						American basswood---	---	---	
						Black cherry--------	---	---	
						White oak-----------	---	---	
15B*:									
Morocco-----------	3w	Slight	Moderate	Slight	Slight	Northern red oak----	65	47	Easte
						White oak-----------	62	45	Euro
						Eastern white pine--	60	106	
						Black oak-----------	---	---	
Newton------------	7w	Slight	Severe	Severe	Severe	Eastern white pine--	55	106	Easte
						Eastern cottonwood--	88	---	whit
						Red maple-----------	---	---	
16B--------------- Capac	3w	Slight	Moderate	Slight	Moderate	Northern red oak----	65	48	Easte
						American basswood---	---	---	whit
						Northern pin oak----	---	---	spru
						White ash-----------	---	---	
						Red maple-----------	---	---	
						Bitternut hickory---	---	---	
						Sugar maple---------	---	---	
						Black cherry--------	---	---	
						American beech------	---	---	

See footnote at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume	T
								cf/ac/yr	
17----------------- Brookston	3w	Slight	Severe	Severe	Moderate	Northern red oak----	55	38	White
						Silver maple--------	---	---	whit
						Red maple-----------	---	---	
						White ash-----------	---	---	
						American basswood---	---	---	
						American sycamore---	---	---	
19A---------------- Brady	3w	Slight	Moderate	Slight	Moderate	Red maple-----------	61	38	Imper
						White ash-----------	---	---	popl
						Quaking aspen-------	---	---	spru
						Silver maple--------	---	---	spru
						Bitternut hickory---	---	---	whit
						Swamp white oak-----	---	---	
						American basswood---	61	38	
21B*:									
Capac--------------	3w	Slight	Moderate	Slight	Moderate	Northern red oak----	65	47	Easte
						American basswood---	---	---	whit
						Northern pin oak----	---	---	spru
						White ash-----------	---	---	
						Red maple-----------	---	---	
						Bitternut hickory---	---	---	
						Sugar maple---------	---	---	
						Black cherry--------	---	---	
						American beech------	---	---	
Wixom--------------	6w	Slight	Moderate	Slight	Moderate	Quaking aspen-------	70	81	Easte
						American beech------	---	---	whit
						Northern red oak----	---	---	
						Red maple-----------	66	41	
						American basswood---	---	---	
22A---------------- Matherton	3w	Slight	Moderate	Slight	Moderate	Northern red oak----	62	45	White
						Swamp white oak-----	---	---	spru
						White oak-----------	---	---	pine
						White ash-----------	---	---	
						American basswood---	---	---	
						Red maple-----------	---	---	
23----------------- Sebewa	3w	Slight	Severe	Severe	Severe	Red maple-----------	62	39	White
						White ash-----------	62	56	whit
						American basswood---	---	---	spru
						Swamp white oak-----	---	---	impe
						Northern red oak----	---	---	popl

See footnote at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume	Tr
								cf/ac/yr	
26A-----------------	3w	Slight	Moderate	Slight	Moderate	Red maple-----------	65	40	White
Pipestone						White ash-----------	---	---	white
						Eastern cottonwood--	---	---	
						Bitternut hickory---	---	---	
						Hackberry-----------	---	---	
						American basswood---	56	40	
						Eastern white pine--	64	133	
27B, 27C------------	3s	Slight	Slight	Moderate	Slight	Northern red oak----	66	48	Easter
Metea						White oak-----------	---	---	red p
						Sugar maple---------	---	---	spruc
						American basswood---	---	---	Norwa
						Black cherry--------	---	---	
						Black walnut--------	---	---	
						Shagbark hickory----	---	---	
28A-----------------	3s	Slight	Moderate	Slight	Slight	Northern red oak----	65	47	White
Rimer						White oak-----------	---	---	white
						Red maple-----------	---	---	white
						Silver maple--------	---	---	
						White ash-----------	---	---	
29------------------	2w	Slight	Severe	Severe	Severe	Red maple-----------	56	36	Easter
Cohoctah						Eastern cottonwood--	---	---	imper
						Silver maple--------	---	---	popla
						White ash-----------	---	---	white
						Swamp white oak-----	---	---	
						American sycamore---	---	---	
						Pin oak-------------	---	---	
						Bitternut hickory---	---	---	
30------------------	2w	Slight	Severe	Severe	Severe	Silver maple--------	82	36	Easte
Colwood						Red maple-----------	56	36	whit
						White ash-----------	56	40	
						Green ash-----------	---	---	
						Swamp white oak-----	---	---	
31B, 31C, 31D-------	3s	Slight	Slight	Moderate	Slight	Northern red oak----	66	48	Black
Tekenink						Black cherry--------	---	---	pine
						White ash-----------	---	---	pine
						American basswood---	---	---	
						American beech------	---	---	
						Sugar maple---------	---	---	

See footnote at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns				Potential productivity			Tr
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume	
								cf/ac/yr	
31E Tekenink	3r	Moderate	Moderate	Moderate	Slight	Northern red oak	66	48	Black
						Black cherry	---	---	pine,
						White ash	---	---	pine,
						American basswood	---	---	
						American beech	---	---	
						Sugar maple	---	---	
33A Kibbie	3w	Slight	Moderate	Slight	Moderate	Northern red oak	66	48	Imperf
						Red maple	---	---	popla
						White ash	---	---	pine,
						American basswood	---	---	
						Quaking aspen	---	---	
36 Corunna	2w	Slight	Severe	Moderate	Moderate	Silver maple	82	36	Easter
						Red maple	56	36	white
						White ash	---	---	
						American basswood	---	---	
						American sycamore	---	---	
						Swamp white oak	---	---	
39 Granby	2w	Slight	Severe	Severe	Severe	Silver maple	82	36	Easter
						Red maple	68	42	Norwa
						American basswood	---	---	spruc
						White ash	---	---	
						Quaking aspen	---	---	
						Eastern cottonwood	---	---	
41B Blount	3c	Slight	Moderate	Severe	Severe	Northern red oak	57	40	Easter
						White oak	57	40	white
						White ash	57	43	spruc
						Sugar maple	54	34	popla
						American basswood	---	---	
42B Metamora	3w	Slight	Moderate	Slight	Moderate	Northern red oak	62	45	White
						White ash	---	---	spruc
						Bitternut hickory	---	---	pine.
						Green ash	---	---	
						Shagbark hickory	---	---	
						American basswood	---	---	
						Sugar maple	---	---	
						Red maple	---	---	
44B, 44C, 44D Chelsea	3s	Slight	Slight	Moderate	Slight	White oak	65	47	Easter
						Red pine	62	98	red p
						Eastern white pine	62	127	
						Jack pine	---	---	
						Quaking aspen	---	---	
						Northern red oak	---	---	

See footnote at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns				Potential productivity			T
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume	
								cf/ac/yr	
44E---------------- Chelsea	3r	Moderate	Severe	Moderate	Slight	White oak-----------	65	47	Easte
						Red pine------------	62	98	red
						Eastern white pine--	62	127	
						Jack pine-----------	---	---	
						Quaking aspen-------	---	---	
						Northern red oak----	---	---	
45----------------- Pewamo	3w	Slight	Severe	Moderate	Moderate	Red maple-----------	66	41	Imper
						American basswood---	66	41	popl
						Silver maple--------	---	---	pine
						White ash-----------	---	---	
						Black ash-----------	---	---	
						Eastern cottonwood--	---	---	
47----------------- Napoleon	2w	Slight	Severe	Severe	Severe	Red maple-----------	56	36	
						Silver maple--------	---	---	
						White ash-----------	---	---	
						Quaking aspen-------	---	---	
						Tamarack------------	---	---	
						Black ash-----------	---	---	
48----------------- Belleville	1w	Slight	Severe	Moderate	Moderate	Silver maple--------	64	20	
						Red maple-----------	---	---	
						White ash-----------	---	---	
						Pin oak-------------	---	---	
						Swamp white oak-----	---	---	
49A---------------- Tedrow	3s	Slight	Moderate	Slight	Slight	White ash-----------	55	38	Easte
						Silver maple--------	---	---	whi
						Eastern white pine--	---	---	impo
						Red maple-----------	---	---	pop
51A---------------- Thetford	3w	Slight	Moderate	Slight	Slight	Red maple-----------	61	38	White
						White ash-----------	---	---	spr
						Quaking aspen-------	---	---	pin
						Eastern cottonwood--	---	---	Car
						Northern red oak----	---	---	
						Swamp white oak-----	---	---	
						Bitternut hickory---	---	---	
53B---------------- Oakville	8s	Slight	Moderate	Severe	Slight	Red pine------------	66	139	Red
						Northern red oak----	---	---	whi
						White oak-----------	---	---	Car
						Quaking aspen-------	---	---	Nor
						Black oak-----------	---	---	
						Eastern white pine--	---	---	

See footnote at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns				Potential productivity			T
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume	
								cf/ac/yr	
57A---------------- Covert	3s	Slight	Moderate	Severe	Slight	Northern red oak----	67	49	Red p
						Red maple-----------	66	41	waln
						Black cherry--------	---	---	pine
						Eastern cottonwood--	---	---	
						American basswood---	---	---	
						White oak-----------	---	---	
						Quaking aspen-------	---	---	
						American beech------	---	---	
						Eastern white pine--	---	---	
60B---------------- Seward	3s	Slight	Slight	Moderate	Slight	Northern red oak----	65	47	Easte
						Red maple-----------	---	---	yell
						Black oak-----------	---	---	pine
						Quaking aspen-------	---	---	
						Yellow-poplar-------	---	---	
						Green ash-----------	---	---	
62----------------- Sloan	3w	Slight	Severe	Severe	Severe	Red maple-----------	66	41	Black
						Swamp white oak-----	---	---	whit
						White ash-----------	66	65	
						Green ash-----------	66	65	
						Eastern cottonwood--	---	---	
63B, 63C----------- Riddles	4a	Slight	Slight	Slight	Slight	Northern red oak----	75	57	Black
						Red maple-----------	75	47	pine
						White ash-----------	75	78	
						Green ash-----------	75	78	
						Black walnut--------	---	---	
						Yellow-poplar-------	---	---	
64*:									
Belleville---------	1w	Slight	Severe	Moderate	Moderate	Silver maple--------	64	20	
						Red maple-----------	---	---	
						White ash-----------	---	---	
						Pin oak-------------	---	---	
						Swamp white oak-----	---	---	
Brookston----------	3w	Slight	Severe	Severe	Moderate	Northern red oak----	55	38	White
						Silver maple--------	---	---	whit
						Red maple-----------	---	---	
						White ash-----------	---	---	
						American basswood---	---	---	
						American sycamore---	---	---	

See footnote at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume	Tr
								cf/ac/yr	
65----------------- Cohoctah	2w	Slight	Moderate	Severe	Severe	Silver maple-------- Red maple----------- Eastern cottonwood-- White ash----------- Swamp white oak----- American sycamore--- Bitternut hickory---	80 55 --- --- --- --- ---	34 35 --- --- --- --- ---	Easter white north
67----------------- Martisco	1w	Slight	Severe	Severe	Severe	Silver maple-------- Red maple----------- Black ash-----------	60 --- ---	36 --- ---	
69----------------- Newton	2w	Slight	Severe	Severe	Severe	Red maple----------- Eastern white pine-- Eastern cottonwood--	55 55 ---	35 106 ---	Easter white Europ
70A---------------- Morocco	4w	Slight	Moderate	Slight	Moderate	Northern red oak---- Eastern white pine-- American basswood--- White ash-----------	70 65 --- ---	52 136 --- ---	Easter Europ white
73A---------------- Algansee	6w	Slight	Moderate	Slight	Moderate	Quaking aspen------- Silver maple-------- Swamp white oak----- White ash----------- Red maple----------- American sycamore---	70 --- --- --- --- ---	81 --- --- --- --- ---	Norway spruc
74----------------- Glendora	3w	Slight	Severe	Severe	Severe	Silver maple-------- Red maple----------- American sycamore--- Swamp white oak----- Quaking aspen------- Eastern cottonwood-- White ash-----------	90 65 --- --- --- --- 65	42 40 --- --- --- --- 63	Easter white ash,
75B*: Marlette----------	3a	Slight	Slight	Slight	Slight	Sugar maple--------- Northern red oak---- White ash----------- Black walnut-------- American basswood--- Black cherry-------- White oak-----------	61 --- --- --- --- --- ---	38 --- --- --- --- --- ---	Black white

See footnote at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns				Potential productivity			T
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume	
								cf/ac/ yr	
75B*:									
Capac-------------	3w	Slight	Moderate	Slight	Moderate	Northern red oak----	65	47	Easte white spru
						American basswood---	---	---	
						Northern pin oak----	---	---	
						White ash-----------	---	---	
						Red maple-----------	---	---	
						Bitternut hickory---	---	---	
						Sugar maple---------	---	---	
						Black cherry--------	---	---	
						American beech------	---	---	

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
2. Glendora					
4*: Dune land.					
Beaches.					
5 Houghton	---	Silky dogwood, late lilac, Amur privet, common ninebark, nannyberry viburnum.	Northern white-cedar.	Eastern white pine, Siberian crabapple, green ash.	Imperial Carolina poplar.
6 Adrian	---	Silky dogwood, common ninebark, Amur privet, American cranberrybush, late lilac, Japanese tree lilac, nannyberry viburnum.	Northern white-cedar.	Eastern white pine, Siberian crabapple, green ash.	Imperial Carolina poplar.
7 Palms	Vanhoutte spirea	Silky dogwood, common ninebark, nannyberry viburnum, American cranberrybush.	Northern white-cedar, Manchurian crabapple, white spruce.	Eastern white pine, Norway spruce, green ash.	Imperial Carolina poplar.
8B, 8C Glynwood	---	Tatarian honeysuckle, silky dogwood, sargent crabapple, autumn-olive, Amur privet.	White spruce, northern white-cedar, green ash.	Eastern white pine, Norway spruce.	Imperial Carolina poplar.
10B, 10C, 10E Oakville	---	Silky dogwood, lilac, Siberian dogwood, Amur privet.	White spruce, Manchurian crabapple.	Eastern white pine, red pine, eastern white pine, Norway spruce, jack pine.	Imperial Carolina poplar.
11B*, 11C*, 11D*, 11E*: Oshtemo	---	Eastern redcedar, lilac, Siberian peashrub, silky dogwood.	Manchurian crabapple.	Eastern white pine, red pine, jack pine.	Imperial Carolina poplar.

See footnote at end of table.

TABLE 10.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
11B*, 11C*, 11D*, 11E*:					
Chelsea---------	---	Siberian peashrub, eastern redcedar, Tatarian honeysuckle, lilac.	Austrian pine-----	Eastern white pine, red pine, jack pine.	---
12B, 12C, 12D, 12E-------------- Ockley	---	American cranberrybush, gray dogwood, lilac, Amur maple.	White spruce, Norway spruce, northern white-cedar.	Eastern white pine, white ash, red maple, red pine.	---
14C, 14D, 14E----- Marlette	---	American cranberrybush, common ninebark, lilac, silky dogwood.	White spruce, Amur maple, Manchurian crabapple, nannyberry viburnum.	Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
15B*:					
Morocco----------	Manyflower cotoneaster.	Lilac, silky dogwood.	Siberian peashrub, Austrian pine.	Eastern white pine, red pine, jack pine, Norway spruce.	Imperial Carolina poplar.
Newton-----------	---	Silky dogwood, redosier dogwood, nannyberry viburnum, common ninebark, American cranberrybush.	Balsam fir, white spruce, northern white-cedar.	Green ash, white ash, red maple, eastern white pine.	---
16B-------------- Capac	---	Silky dogwood, American cranberrybush, Amur privet, Amur maple, lilac.	White spruce, northern white-cedar.	Eastern white pine, red maple, Norway spruce, green ash.	Imperial Carolina poplar.
17--------------- Brookston	---	Redosier dogwood, common ninebark, nannyberry viburnum, silky dogwood, American cranberrybush.	White spruce, balsam fir, northern white-cedar.	Green ash, white ash, red maple, Norway spruce.	---
18*. Pits					
19A-------------- Brady	---	Silky dogwood, lilac, nannyberry viburnum, Amur maple, American cranberrybush.	White spruce, northern white-cedar.	Norway spruce, eastern white pine, red pine, green ash.	Imperial Carolina poplar.
21B*:					
Capac------------	---	Silky dogwood, American cranberrybush, Amur privet, Amur maple, lilac.	White spruce, northern white-cedar.	Eastern white pine, red maple, Norway spruce, green ash.	Imperial Carolina poplar.

See footnote at end of table.

TABLE 10.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
21B*: Wixom	---	Silky dogwood, lilac, Amur privet, American cranberrybush, Amur maple.	White spruce, northern white-cedar.	Eastern white pine, Norway spruce, green ash, red maple.	Imperial Carolina poplar.
22A Matherton	Vanhoutte spirea	Silky dogwood, nannyberry viburnum, Amur privet, Amur maple, American cranberrybush.	Northern white-cedar, white spruce, Manchurian crabapple.	Eastern white pine, Norway spruce.	Imperial Carolina poplar.
23 Sebewa	---	Silky dogwood, lilac, Amur privet, American cranberrybush, nannyberry viburnum.	White spruce, northern white-cedar, Manchurian crabapple.	Eastern white pine, Norway spruce, green ash.	Imperial Carolina poplar.
26A Pipestone	---	Lilac, Amur maple, Amur privet, silky dogwood, American cranberrybush.	Northern white-cedar, white spruce.	Red maple, Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
27B, 27C Metea	---	Amur maple, silky dogwood, American cranberrybush, Siberian peashrub, gray dogwood, lilac, eastern redcedar.	White spruce, Manchurian crabapple.	Eastern white pine, red pine, jack pine.	---
28A Rimer	---	Common ninebark, Amur privet, silky dogwood, American cranberrybush, gray dogwood, nannyberry viburnum.	White spruce, northern white-cedar, Manchurian crabapple.	Eastern white pine, Norway spruce, green ash.	---
29 Cohoctah	---	Amur privet, Amur privet, American cranberrybush, lilac, nannyberry viburnum, silky dogwood.	Northern white-cedar, Manchurian crabapple, white spruce.	Green ash, eastern white pine.	Imperial Carolina poplar.
30 Colwood	---	Silky dogwood, American cranberrybush, Amur privet, nannyberry viburnum, lilac.	Manchurian crabapple, northern white-cedar, white spruce.	Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.

See footnote at end of table.

TABLE 10.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
31B, 31C, 31D, 31E: Tekenink	---	Amur privet, nannyberry viburnum, lilac, silky dogwood, American cranberrybush.	White spruce, northern white-cedar.	Eastern white pine, red pine, Norway spruce, green ash.	Imperial Carolina poplar.
33A: Kibbie	---	Silky dogwood, lilac, nannyberry viburnum, American cranberrybush, Amur privet.	Northern white-cedar, white spruce, Siberian crabapple.	Eastern white pine, green ash, Norway spruce.	Imperial Carolina poplar.
34. Aquents					
36: Corunna	---	Silky dogwood, American cranberrybush, lilac, nannyberry viburnum, Amur privet.	Northern white-cedar, Manchurian crabapple, white spruce.	Green ash, eastern white pine, Norway spruce.	Imperial Carolina poplar.
39: Granby	---	Silky dogwood, Amur privet, American cranberrybush, lilac, nannyberry viburnum.	Northern white-cedar, white spruce, Manchurian crabapple.	Eastern white pine, Norway spruce, green ash.	Imperial Carolina poplar.
41B: Blount	---	American cranberrybush, Amur privet, late lilac, northern white-cedar.	White spruce, northern white-cedar.	White ash, red pine, eastern white pine, Norway spruce, red maple, silver maple, green ash.	---
42B: Metamora	---	Silky dogwood, American cranberrybush, lilac, Amur maple, Amur privet.	Northern white-cedar, white spruce.	Eastern white pine, Norway spruce, green ash, red maple.	Imperial Carolina poplar.
44B, 44C, 44D, 44E: Chelsea	---	Siberian peashrub, eastern redcedar, Tatarian honeysuckle, lilac.	Austrian pine	Eastern white pine, red pine, jack pine.	---
45: Pewamo	---	American cranberrybush, silky dogwood, Amur privet, lilac, common ninebark.	Northern white-cedar, Siberian crabapple, white spruce.	Green ash, Norway spruce, eastern white pine.	Imperial Carolina poplar.
47. Napoleon					

See footnote at end of table.

TABLE 10.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
48. Belleville	---	Silky dogwood, Amur privet, nannyberry viburnum, lilac, American cranberrybush.	White spruce, northern white-cedar, Manchurian crabapple.	Eastern white pine, green ash, Norway spruce.	Imperial Carolina poplar.
49A. Tedrow	Vanhoutte spirea	Gray dogwood, common ninebark, American cranberrybush, silky dogwood, Amur privet.	Northern white-cedar, Manchurian crabapple, white spruce.	Eastern white pine, Norway spruce, green ash.	---
50*:					
Aquents.					
Histosols.					
51A. Thetford	---	Silky dogwood, lilac, Amur maple, American cranberrybush, Amur privet.	White spruce, northern white-cedar.	Norway spruce, eastern white pine, red maple, green ash.	Imperial Carolina poplar.
53B. Oakville	---	Common ninebark, American cranberrybush, autumn-olive, silky dogwood, lilac, Amur privet.	Manchurian crabapple, white spruce.	Eastern white pine, red pine, Norway spruce.	Imperial Carolina poplar.
57A. Covert	---	Lilac, American cranberrybush, Amur privet, Amur maple, silky dogwood.	White spruce, northern white-cedar.	Red maple, eastern white pine, Norway spruce, green ash.	Imperial Carolina poplar.
60B. Seward	Manyflower cotoneaster.	Eastern redcedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	White spruce, Manchurian crabapple.	Eastern white pine, red pine, jack pine, Norway spruce.	---
62. Sloan	Vanhoutte spirea	Green ash, silky dogwood, Amur privet, Tatarian honeysuckle, American cranberrybush.	Northern white-cedar, Manchurian crabapple, white spruce.	Norway spruce, green ash.	Imperial Carolina poplar.
63B, 63C. Riddles	---	Amur privet, Amur honeysuckle, American cranberrybush, Washington hawthorn, Tatarian honeysuckle.	Eastern redcedar, Austrian pine, northern white-cedar, osageorange.	Eastern white pine, Norway spruce, red pine.	---

See footnote at end of table.

TABLE 10.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
64*:					
Belleville	---	Silky dogwood, Amur privet, nannyberry viburnum, lilac, American cranberrybush.	White spruce, northern white-cedar, Manchurian crabapple.	Eastern white pine, green ash, Norway spruce.	Imperial Carolina poplar.
Brookston	---	Redosier dogwood, common ninebark, nannyberry viburnum, silky dogwood, American cranberrybush.	White spruce, balsam fir, northern white-cedar.	Green ash, white ash, red maple, Norway spruce.	---
65 Cohoctah	---	Silky dogwood, American cranberrybush, common ninebark, nannyberry viburnum, lilac.	White spruce, northern white-cedar, Manchurian crabapple.	Eastern white pine, green ash, Norway spruce.	Imperial Carolina poplar.
66. Udipsamments					
67. Martisco					
69 Newton	---	Silky dogwood, redosier dogwood, nannyberry viburnum, common ninebark, American cranberrybush.	Balsam fir, white spruce, northern white-cedar.	Green ash, white ash, red maple, eastern white pine.	---
70A Morocco	Manyflower cotoneaster.	Lilac, silky dogwood.	Siberian peashrub, Austrian pine.	Eastern white pine, red pine, jack pine, Norway spruce.	Green ash, Imperial Carolina poplar.
72B*: Urban land.					
Oakville	---	Silky dogwood, lilac, Siberian dogwood, Amur privet.	White spruce, Manchurian crabapple.	Eastern white pine, red pine, eastern white pine, Norway spruce, jack pine.	Imperial Carolina poplar.
73A Algansee	---	Amur privet, American cranberrybush, lilac, silky dogwood.	White spruce, northern white-cedar, Siberian crabapple.	Eastern white pine, Norway spruce, green ash.	Imperial Carolina poplar.
74 Glendora	---	Common ninebark, nannyberry viburnum, American cranberrybush, lilac.	White spruce, northern white-cedar, Siberian crabapple.	Norway spruce, red maple, green ash, eastern white pine.	Imperial Carolina poplar.

See footnote at end of table.

TABLE 10.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
75B*:					
Marlette	---	American cranberrybush, lilac, silky dogwood.	White spruce, northern white-cedar, Amur maple, Manchurian crabapple, nannyberry viburnum.	Norway spruce, eastern white pine, green ash.	Imperial Carolina poplar.
Capac	---	Silky dogwood, American cranberrybush, Amur privet, Amur maple, lilac.	White spruce, northern white-cedar.	Eastern white pine, red maple, Norway spruce, green ash.	Imperial Carolina poplar.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
2 Glendora	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
4*:					
Dune land.					
Beaches.					
5 Houghton	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.
6 Adrian	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.
7 Palms	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
8B Glynwood	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: wetness, slope, percs slowly.	Moderate: wetness.	Slight.
8C Glynwood	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
10B Oakville	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
10C Oakville	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: slope, droughty.
10E Oakville	Severe: too sandy, slope.	Severe: too sandy, slope.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope.
11B*:					
Oshtemo	Slight	Slight	Moderate: slope.	Slight	Slight.
Chelsea	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
11C*:					
Oshtemo	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Chelsea	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, droughty.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
11D*, 11E*:					
Oshtemo	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Chelsea	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
12B Ockley	Slight	Slight	Moderate: slope.	Slight	Slight.
12C Ockley	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
12D Ockley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
12E Ockley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
14C Marlette	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
14D, 14E Marlette	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
15B*:					
Morocco	Severe: wetness, too sandy.	Severe: too sandy.	Severe: too sandy, wetness.	Severe: too sandy.	Moderate: wetness, droughty.
Newton	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: ponding.
16B Capac	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
17 Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
18*. Pits					
19A Brady	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
21B*:					
Capac	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Wixom	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
22A Matherton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
23------------------- Sebewa	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
26A------------------ Pipestone	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
27B------------------ Metea	Slight----------	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Moderate: droughty.
27C------------------ Metea	Moderate: slope.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: droughty, slope.
28A------------------ Rimer	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, droughty.
29------------------- Cohoctah	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: flooding, wetness.
30------------------- Colwood	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
31B------------------ Tekenink	Slight----------	Slight----------	Moderate: slope.	Slight----------	Moderate: droughty.
31C------------------ Tekenink	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: droughty, slope.
31D------------------ Tekenink	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
31E------------------ Tekenink	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
33A------------------ Kibbie	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
34. Aquents					
36------------------- Corunna	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
39------------------- Granby	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
41B------------------ Blount	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
42B------------------ Metamora	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
44B------------------ Chelsea	Slight----------	Slight----------	Moderate: slope.	Slight----------	Moderate: droughty.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
44C------------------- Chelsea	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope, droughty.
44D, 44E------------- Chelsea	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
45-------------------- Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
47-------------------- Napoleon	Severe: ponding, excess humus, too acid.	Severe: ponding, excess humus, too acid.	Severe: excess humus, ponding, too acid.	Severe: ponding, excess humus.	Severe: too acid, ponding, excess humus.
48-------------------- Belleville	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
49A------------------- Tedrow	Severe: wetness, too sandy.	Severe: too sandy.	Severe: too sandy, wetness.	Severe: too sandy.	Moderate: wetness, droughty.
50*:					
Aquents.					
Histosols.					
51A------------------- Thetford	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
53B------------------- Oakville	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
57A------------------- Covert	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
60B------------------- Seward	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight----------	Moderate: droughty.
62-------------------- Sloan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
63B------------------- Riddles	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
63C------------------- Riddles	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
64*:					
Belleville-----------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Brookston------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
65-------------------- Cohoctah	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
66. Udipsamments					
67 Martisco	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, flooding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, flooding, excess humus.
69 Newton	Severe: too sandy, ponding.	Severe: too sandy, ponding.	Severe: too sandy, ponding.	Severe: too sandy, ponding.	Severe: ponding.
70A Morocco	Severe: wetness, too sandy.	Severe: too sandy.	Severe: too sandy, wetness.	Severe: too sandy.	Moderate: wetness, droughty.
72B*: Urban land.					
Oakville	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
73A Algansee	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
74 Glendora	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
75B*: Marlette	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Capac	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
2----------------- Glendora	Poor	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair.
4*: Dune land.										
Beaches.										
5----------------- Houghton	Fair	Poor	Poor	Fair	Fair	Good	Good	Poor	Poor	Good.
6----------------- Adrian	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
7----------------- Palms	Good	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
8B---------------- Glynwood	Good	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
8C---------------- Glynwood	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
10B--------------- Oakville	Poor	Poor	Fair	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
10C--------------- Oakville	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
10E--------------- Oakville	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
11B*: Oshtemo-----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Chelsea-----------	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
11C*, 11D*, 11E*: Oshtemo-----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Chelsea-----------	Very poor.	Fair	Fair	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
12B--------------- Ockley	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
12C--------------- Ockley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
12D--------------- Ockley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
12E--------------- Ockley	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
14C----------------- Marlette	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
14D, 14E----------- Marlette	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
15B*:										
Morocco-----------	Poor	Poor	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Newton------------	Very poor.	Poor	Poor	Fair	Fair	Good	Good	Poor	Fair	Good.
16B----------------- Capac	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor.
17------------------ Brookston	Fair	Poor	Poor	Good	Good	Good	Good	Poor	Poor	Fair.
18*. Pits										
19A----------------- Brady	Good	Good	Good	Fair	Fair	Fair	Fair	Good	Fair	Fair.
21B*:										
Capac-------------	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor.
Wixom-------------	Poor	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
22A----------------- Matherton	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
23------------------ Sebewa	Good	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
26A----------------- Pipestone	Poor	Poor	Fair	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
27B----------------- Metea	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
27C----------------- Metea	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
28A----------------- Rimer	Poor	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
29------------------ Cohoctah	Poor	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
30------------------ Colwood	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
31B, 31C, 31D------ Tekenink	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
31E----------------- Tekenink	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
33A----------------- Kibbie	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
34. Aquents										
36------------------ Corunna	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
39------------------ Granby	Poor	Poor	Poor	Fair	Fair	Good	Good	Poor	Poor	Good.
41B----------------- Blount	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
42B----------------- Metamora	Fair	Good	Good	Good	Good	Very poor.	Poor	Good	Good	Very poor.
44B----------------- Chelsea	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
44C, 44D, 44E------ Chelsea	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
45------------------ Pewamo	Good	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
47------------------ Napoleon	Very poor.	Very poor.	Poor	Fair	Fair	Good	Good	Very poor.	Fair	Good.
48------------------ Belleville	Poor	Fair	Fair	Poor	Poor	Fair	Good	Fair	Poor	Fair.
49A----------------- Tedrow	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
50*: Aquents.										
Histosols.										
51A----------------- Thetford	Poor	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
53B----------------- Oakville	Poor	Poor	Fair	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
57A----------------- Covert	Poor	Poor	Fair	Good	Good	Poor	Poor	Poor	Good	Poor.
60B----------------- Seward	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
62------------------ Sloan	Fair	Fair	Good	Poor	Poor	Good	Good	Fair	Poor	Good.
63B----------------- Riddles	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
63C----------------- Riddles	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
64*:										
Belleville	Poor	Fair	Fair	Poor	Poor	Fair	Good	Fair	Poor	Fair.
Brookston	Fair	Poor	Good	Good	Poor	Good	Good	Poor	Fair	Good.
65 Cohoctah	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
66. Udipsamments										
67 Martisco	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
69 Newton	Very poor.	Poor	Poor	Fair	Fair	Good	Good	Poor	Fair	Good.
70A Morocco	Poor	Poor	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
72B*: Urban land.										
Oakville	Poor	Poor	Fair	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
73A Algansee	Poor	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
74. Glendora										
75B*:										
Marlette	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Capac	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
2----------------- Glendora	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
4*:						
Dune land.						
Beaches.						
5----------------- Houghton	Severe: ponding, excess humus.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength, frost action.	Severe: excess humus, ponding.
6----------------- Adrian	Severe: ponding, cutbanks cave, excess humus.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, low strength, frost action.	Severe: excess humus, ponding.
7----------------- Palms	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, frost action, subsides.	Severe: ponding, excess humus.
8B---------------- Glynwood	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: frost action, low strength.	Slight.
8C---------------- Glynwood	Severe: wetness.	Moderate: slope, shrink-swell, wetness.	Severe: wetness.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
10B--------------- Oakville	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
10C--------------- Oakville	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope, droughty.
10E--------------- Oakville	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
11B*:						
Oshtemo----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
Chelsea----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
11C*:						
Oshtemo----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
11C*:						
Chelsea	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope, droughty.
11D*, 11E*:						
Oshtemo	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Chelsea	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
12B Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
12C Ockley	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
12D, 12E Ockley	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
14C Marlette	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
14D, 14E Marlette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
15B*:						
Morocco	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
Newton	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
16B Capac	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
17 Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
18*. Pits						
19A Brady	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
21B*:						
Capac	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
21B*:						
Wixom	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
22A Matherton	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
23 Sebewa	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
26A Pipestone	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
27B Metea	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
27C Metea	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
28A Rimer	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: frost action.	Moderate: wetness, droughty.
29 Cohoctah	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action, wetness.	Severe: flooding, wetness.
30 Colwood	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
31B Tekenink	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Moderate: large stones, droughty.
31C Tekenink	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, droughty, slope.
31D, 31E Tekenink	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
33A Kibbie	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
34. Aquents						
36 Corunna	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
39---------------- Granby	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
41B--------------- Blount	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
42B--------------- Metamora	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
44B--------------- Chelsea	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
44C--------------- Chelsea	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope, droughty.
44D, 44E---------- Chelsea	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
45---------------- Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
47---------------- Napoleon	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: too acid, ponding, excess humus.
48---------------- Belleville	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
49A--------------- Tedrow	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
50*: Aquents.						
Histosols.						
51A--------------- Thetford	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
53B--------------- Oakville	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Slight---------	Moderate: droughty.
57A--------------- Covert	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty, too sandy.
60B--------------- Seward	Severe: cutbanks cave.	Slight---------	Severe: shrink-swell.	Slight---------	Moderate: frost action.	Moderate: droughty.
62---------------- Sloan	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
63B--------------- Riddles	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
63C--------------- Riddles	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
64*:						
Belleville--------	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
Brookston--------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
65---------------- Cohoctah	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, frost action.	Severe: ponding.
66. Udipsamments						
67---------------- Martisco	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding, frost action.	Severe: ponding, flooding, excess humus.
69---------------- Newton	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
70A--------------- Morocco	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
72B*: Urban land.						
Oakville---------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
73A--------------- Algansee	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Moderate: wetness, flooding, frost action.	Moderate: wetness, droughty.
74---------------- Glendora	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.
75B*:						
Marlette---------	Moderate: wetness.	Slight---------	Moderate: wetness.	Slight---------	Severe: low strength.	Slight.
Capac------------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
2 Glendora	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
4*:					
Dune land.					
Beaches.					
5 Houghton	Severe: ponding, percs slowly.	Severe: seepage, ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, seepage.	Poor: ponding, excess humus.
6 Adrian	Severe: ponding, poor filter.	Severe: seepage, ponding, excess humus.	Severe: ponding, seepage.	Severe: ponding, seepage.	Poor: ponding, excess humus.
7 Palms	Severe: subsides, ponding.	Severe: seepage, excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, seepage.	Poor: ponding, excess humus.
8B Glynwood	Severe: percs slowly, wetness.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
8C Glynwood	Severe: percs slowly, wetness.	Severe: slope.	Moderate: wetness, too clayey, slope.	Moderate: slope, wetness.	Fair: slope, too clayey, wetness.
10B Oakville	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
10C Oakville	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
10E Oakville	Severe: slope, poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy, slope.	Severe: seepage, slope.	Poor: too sandy, slope, seepage.
11B*:					
Oshtemo	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Chelsea	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
11C*:					
Oshtemo	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Chelsea	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
11D*, 11E*:					
Oshtemo	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, slope.
Chelsea	Severe: slope, poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy, slope.	Severe: seepage, slope.	Poor: too sandy, slope, seepage.
12B Ockley	Slight	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey.
12C Ockley	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: slope, too clayey.
12D, 12E Ockley	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
14C Marlette	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
14D, 14E Marlette	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
15B*:					
Morocco	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: too sandy, wetness, seepage.
Newton	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: too sandy, seepage, ponding.
16B Capac	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
17 Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
18*. Pits					

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
19A----------------- Brady	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
21B*:					
Capac---------------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Wixom---------------	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
22A----------------- Matherton	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
23------------------ Sebewa	Severe: poor filter, ponding.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: small stones, seepage, too sandy.
26A----------------- Pipestone	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
27B----------------- Metea	Severe: poor filter, percs slowly.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
27C----------------- Metea	Severe: poor filter, percs slowly.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
28A----------------- Rimer	Severe: wetness, percs slowly.	Severe: seepage.	Severe: wetness, too clayey.	Severe: seepage, wetness.	Poor: too clayey, hard to pack, wetness.
29------------------ Cohoctah	Severe: wetness, flooding.	Severe: flooding, seepage, wetness.	Severe: seepage, flooding, wetness.	Severe: seepage, flooding, wetness.	Poor: wetness.
30------------------ Colwood	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding, thin layer.
31B----------------- Tekenink	Slight-----------	Severe: seepage.	Severe: seepage.	Slight-----------	Good.
31C----------------- Tekenink	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: slope.
31D, 31E------------ Tekenink	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
33A----------------- Kibbie	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: too sandy, wetness.
34. Aquents					
36------------------ Corunna	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
39------------------ Granby	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
41B----------------- Blount	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
42B----------------- Metamora	Severe: percs slowly, wetness.	Severe: wetness, seepage.	Severe: wetness.	Severe: wetness, seepage.	Poor: wetness.
44B----------------- Chelsea	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
44C----------------- Chelsea	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
44D, 44E------------ Chelsea	Severe: slope, poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy, slope.	Severe: seepage, slope.	Poor: too sandy, slope, seepage.
45------------------ Pewamo	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, ponding, hard to pack.
47------------------ Napoleon	Severe: ponding.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus, too acid.
48------------------ Belleville	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
49A----------------- Tedrow	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
50*: Aquents.					
Histosols.					

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
51A----------------- Thetford	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness, thin layer.
53B----------------- Oakville	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
57A----------------- Covert	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
60B----------------- Seward	Severe: percs slowly, wetness.	Severe: seepage.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
62------------------ Sloan	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
63B----------------- Riddles	Slight-----------	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
63C----------------- Riddles	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
64*:					
Belleville----------	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
Brookston----------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
65------------------ Cohoctah	Severe: ponding.	Severe: seepage, flooding, ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Poor: ponding.
66. Udipsamments					
67------------------ Martisco	Severe: flooding, ponding, percs slowly.	Severe: seepage, flooding, excess humus.	Severe: flooding, ponding.	Severe: flooding, seepage, ponding.	Poor: ponding.
69------------------ Newton	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: too sandy, seepage, ponding.
70A----------------- Morocco	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: too sandy, wetness, seepage.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
72B*:					
Urban land.					
Oakville	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
73A Algansee	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
74 Glendora	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
75B*:					
Marlette	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Capac	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
2: Glendora	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
4*:				
Dune land.				
Beaches.				
5: Houghton	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: wetness, excess humus.
6: Adrian	Poor: wetness, low strength.	Probable	Improbable: too sandy.	Poor: wetness, excess humus.
7: Palms	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess humus.
8B, 8C: Glynwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
10B, 10C: Oakville	Good	Probable	Improbable: too sandy.	Poor: too sandy.
10E: Oakville	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
11B*:				
Oshtemo	Good	Probable	Probable	Poor: small stones.
Chelsea	Good	Probable	Improbable: too sandy.	Fair: too sandy.
11C*:				
Oshtemo	Good	Probable	Probable	Poor: small stones.
Chelsea	Good	Probable	Improbable: too sandy.	Fair: too sandy, slope.
11D*, 11E*:				
Oshtemo	Fair: slope.	Probable	Probable	Poor: small stones, slope.
Chelsea	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
12B, 12C------------- Ockley	Good----------------	Probable------------	Probable------------	Poor: small stones, area reclaim.
12D------------------ Ockley	Fair: slope.	Probable------------	Probable------------	Poor: small stones, area reclaim, slope.
12E------------------ Ockley	Poor: slope.	Probable------------	Probable------------	Poor: small stones, area reclaim, slope.
14C------------------ Marlette	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
14D, 14E------------- Marlette	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
15B*:				
Morocco--------------	Fair: wetness.	Probable------------	Improbable: too sandy.	Poor: too sandy.
Newton---------------	Poor: wetness.	Probable------------	Improbable: too sandy.	Poor: too sandy, wetness.
16B------------------ Capac	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
17------------------- Brookston	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
18*. Pits				
19A------------------ Brady	Fair: wetness.	Probable------------	Probable------------	Poor: small stones.
21B*:				
Capac----------------	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Wixom----------------	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
22A------------------ Matherton	Fair: wetness.	Probable------------	Probable------------	Poor: area reclaim.
23------------------- Sebewa	Poor: wetness.	Probable------------	Probable------------	Poor: wetness, small stones, area reclaim.
26A------------------ Pipestone	Poor: wetness.	Probable------------	Improbable: too sandy.	Poor: too sandy, wetness.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
27B Metea	Good	Improbable: thin layer.	Improbable: too sandy.	Fair: too sandy, area reclaim.
27C Metea	Good	Improbable: thin layer.	Improbable: too sandy.	Fair: too sandy, area reclaim.
28A Rimer	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too sandy.
29 Cohoctah	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
30 Colwood	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
31B, 31C Tekenink	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
31D Tekenink	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
31E Tekenink	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
33A Kibbie	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
34. Aquents				
36 Corunna	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
39 Granby	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
41B Blount	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
42B Metamora	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
44B Chelsea	Good	Probable	Improbable: too sandy.	Fair: too sandy.
44C Chelsea	Good	Probable	Improbable: too sandy.	Fair: too sandy, slope.
44D, 44E Chelsea	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.
45 Pewamo	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
47: Napoleon	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness, too acid.
48: Belleville	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
49A: Tedrow	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
50*:				
Aquents.				
Histosols.				
51A: Thetford	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
53B: Oakville	Fair: thin layer.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
57A: Covert	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
60B: Seward	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
62: Sloan	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
63B: Riddles	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
63C: Riddles	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
64*:				
Belleville	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Brookston	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
65: Cohoctah	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
66. Udipsamments				
67: Martisco	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess humus.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
69: Newton	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
70A: Morocco	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
72B*: Urban land.				
Oakville	Good	Probable	Improbable: too sandy.	Poor: too sandy.
73A: Algansee	Fair: wetness.	Probable	Improbable: too sandy.	Poor: thin layer.
74: Glendora	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
75B*: Marlette	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Capac	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Grassed waterways
2----------------- Glendora	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty.
4*: Dune land.						
Beaches.						
5----------------- Houghton	Severe: seepage.	Severe: excess humus, ponding.	Moderate: slow refill.	Frost action, subsides, ponding.	Soil blowing, ponding.	Wetness.
6----------------- Adrian	Severe: seepage.	Severe: seepage, ponding, excess humus.	Severe: slow refill, cutbanks cave.	Ponding, frost action, subsides.	Ponding, soil blowing.	Wetness.
7----------------- Palms	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
8B---------------- Glynwood	Moderate: slope.	Moderate: wetness, piping.	Severe: no water.	Slope, percs slowly, frost action.	Slope, percs slowly, wetness.	Erodes easily.
8C---------------- Glynwood	Severe: slope.	Moderate: wetness, piping.	Severe: no water.	Slope, percs slowly, frost action.	Slope, percs slowly, wetness.	Slope, erodes easily.
10B--------------- Oakville	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Fast intake, droughty, soil blowing.	Droughty.
10C, 10E---------- Oakville	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Fast intake, droughty, soil blowing.	Slope, droughty.
11B*: Oshtemo----------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Fast intake, soil blowing, slope.	Favorable.
Chelsea----------	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
11C*, 11D*, 11E*: Oshtemo----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Fast intake, soil blowing, slope.	Slope.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
11C*, 11D*, 11E*: Chelsea	Severe: slope, seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, droughty.
12B Ockley	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily.
12C, 12D, 12E Ockley	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
14C, 14D, 14E Marlette	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope.
15B*: Morocco	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Droughty, fast intake, wetness.	Wetness, droughty.
Newton	Severe: seepage.	Severe: piping, seepage, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Wetness, droughty.
16B Capac	Moderate: slope.	Severe: piping, wetness.	Severe: slow refill.	Slope, frost action.	Wetness, slope.	Wetness.
17 Brookston	Moderate: seepage.	Severe: ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding	Wetness.
18*. Pits						
19A Brady	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Frost action	Wetness, soil blowing.	Wetness.
21B*: Capac	Moderate: slope.	Severe: piping, wetness.	Severe: slow refill.	Slope, frost action.	Wetness, slope.	Wetness.
Wixom	Severe: seepage.	Severe: piping, wetness.	Severe: no water.	Slope	Wetness, droughty, fast intake.	Wetness, erodes easily, droughty.
22A Matherton	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness	Wetness.
23 Sebewa	Severe: seepage.	Severe: seepage, ponding.	Severe: cutbanks cave.	Frost action, cutbanks cave, ponding.	Ponding	Wetness.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
26A--------------- Pipestone	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Slope, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty.
27B--------------- Metea	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Droughty, rooting depth.
27C--------------- Metea	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, droughty, rooting depth.
28A--------------- Rimer	Severe: seepage.	Moderate: wetness, hard to pack.	Severe: no water.	Percs slowly, frost action.	Wetness, droughty, fast intake.	Wetness, droughty, rooting depth.
29---------------- Cohoctah	Severe: seepage.	Severe: piping, wetness.	Slight---------	Flooding, frost action.	Wetness, soil blowing.	Wetness.
30---------------- Colwood	Moderate: seepage.	Severe: piping, ponding.	Severe: cutbanks cave.	Ponding, frost action.	Ponding---------	Wetness, erodes easily.
31B--------------- Tekenink	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
31C, 31D, 31E----- Tekenink	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, droughty.
33A--------------- Kibbie	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness---------	Wetness, erodes easily.
34. Aquents						
36---------------- Corunna	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, frost action, cutbanks cave.	Ponding, soil blowing.	Wetness, erodes easily.
39---------------- Granby	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Wetness, droughty.
41B--------------- Blount	Moderate: slope.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly.	Wetness, erodes easily.
42B--------------- Metamora	Moderate: slope.	Severe: wetness, piping.	Severe: slow refill.	Slope, frost action.	Wetness, soil blowing, slope.	Wetness.
44B--------------- Chelsea	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
44C, 44D, 44E----- Chelsea	Severe: slope, seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, droughty.
45---------------- Pewamo	Slight---------	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding---------	Wetness.
47---------------- Napoleon	Severe: seepage.	Severe: excess humus, wetness.	Moderate: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing, too acid.	Wetness.
48---------------- Belleville	Severe: seepage.	Severe: ponding.	Severe: slow refill, cutbanks cave.	Ponding, frost action.	Ponding, droughty, fast intake.	Wetness, droughty.
49A--------------- Tedrow	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Slope, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty.
50*:						
Aquents.						
Histosols.						
51A--------------- Thetford	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Slope, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty.
53B--------------- Oakville	Severe: seepage.	Severe: seepage, piping.	Severe: slow refill, cutbanks cave.	Deep to water	Droughty, fast intake, soil blowing.	Droughty.
57A--------------- Covert	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Slope, cutbanks cave.	Wetness, droughty, fast intake.	Droughty.
60B--------------- Seward	Severe: seepage.	Moderate: hard to pack.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Droughty, rooting depth.
62---------------- Sloan	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action.	Wetness, erodes easily, flooding.	Wetness, erodes easily.
63B--------------- Riddles	Moderate: seepage, slope.	Slight---------	Severe: no water.	Deep to water	Slope----------	Favorable.
63C--------------- Riddles	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope----------	Slope.
64*:						
Belleville--------	Severe: seepage.	Severe: ponding.	Severe: slow refill, cutbanks cave.	Ponding, frost action.	Ponding, droughty, fast intake.	Wetness, droughty.
Brookston---------	Moderate: seepage.	Severe: ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding---------	Wetness.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
65: Cohoctah	Severe: seepage.	Severe: piping, ponding.	Severe: cutbanks cave.	Ponding, frost action.	Ponding	Wetness.
66. Udipsamments						
67: Martisco	Severe: seepage.	Severe: ponding.	Severe: slow refill.	Percs slowly, ponding, flooding.	Ponding, soil blowing, flooding.	Wetness, percs slowly.
69: Newton	Severe: seepage.	Severe: piping, seepage, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Wetness, droughty.
70A: Morocco	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Droughty, fast intake, wetness.	Wetness, droughty.
72B*: Urban land.						
Oakville	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Fast intake, droughty, soil blowing.	Droughty.
73A: Algansee	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
74: Glendora	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Wetness, droughty.
75B*: Marlette	Moderate: slope.	Severe: piping.	Severe: slow refill.	Slope	Wetness, slope.	Favorable.
Capac	Moderate: slope.	Severe: piping, wetness.	Severe: slow refill.	Slope, frost action.	Wetness, slope.	Wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
2---------------- Glendora	0-11	Loamy sand-------	SP-SM, SM	A-3, A-2, A-4, A-1	0-5	95-100	90-100	45-95	5-40	<20	NP-4
	11-60	Stratified sand to loamy fine sand.	SP, SM, SP-SM	A-3, A-2-4, A-1-b	0-5	95-100	90-100	45-85	0-35	---	NP
4*: Dune land.											
Beaches.											
5---------------- Houghton	0-60	Muck-------------	PT	A-8	0	---	---	---	---	---	---
6---------------- Adrian	0-34	Sapric material	PT	A-8	---	---	---	---	---	---	---
	34-60	Sand, loamy sand, fine sand.	SP, SM	A-2, A-3, A-1	0	80-100	60-100	35-75	0-30	---	NP
7---------------- Palms	0-22	Sapric material	PT	A-8	---	---	---	---	---	---	---
	22-60	Silt loam, silty clay loam, fine sandy loam.	CL-ML, CL	A-4, A-6	0	85-100	80-100	70-95	50-90	25-40	5-20
8B, 8C----------- Glynwood	0-10	Clay loam--------	CL	A-6, A-7	0-2	95-100	85-100	75-100	60-95	25-45	10-22
	10-29	Clay, clay loam, silty clay loam.	CL, CH	A-7, A-6	0-5	95-100	85-100	75-100	65-95	35-55	15-30
	29-60	Clay loam, silty clay loam.	CL	A-6, A-4	0-5	95-100	80-100	75-95	65-90	25-40	7-18
10B, 10C, 10E---- Oakville	0-9	Fine sand--------	SM, SP, SP-SM	A-2, A-3	0	100	100	50-85	0-35	---	NP
	9-60	Fine sand, sand, loamy fine sand.	SM, SP, SP-SM	A-2, A-3	0	100	95-100	65-95	0-25	---	NP
11B*, 11C*, 11D*, 11E*: Oshtemo--------	0-10	Loamy sand-------	SM	A-2, A-1, A-4	0	95-100	60-95	40-70	15-40	---	NP
	10-35	Sandy loam, sandy clay loam, gravelly sandy loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	95-100	60-95	60-85	25-45	12-30	2-16
	35-60	Loamy sand, sandy loam, sand.	SM, SP-SM	A-2	0	85-95	60-95	55-70	10-30	---	NP
Chelsea--------	0-4	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-80	10-35	---	NP
	4-70	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-80	3-15	---	NP
12B, 12C, 12D, 12E------------- Ockley	0-11	Loam-------------	CL, ML, CL-ML	A-4	0	95-100	85-100	70-100	50-90	15-30	3-10
	11-42	Sandy clay loam, clay loam, sandy loam.	CL	A-6, A-4	0	90-100	80-100	70-90	55-90	25-40	8-15
	42-60	Stratified sand to gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	10-40	2-10	---	NP

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
14C, 14D, 14E----Marlette	0-10	Loam-------------	CL, ML, CL-ML	A-4	0-5	95-100	85-95	80-95	60-70	20-30	3-10
	10-38	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	85-95	80-95	55-90	20-40	5-25
	38-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	85-95	75-95	50-75	20-40	5-25
15B*:											
Morocco---------	0-3	Fine sand--------	SM, SM-SC	A-2-4	0	100	100	65-85	20-35	<20	NP-5
	3-60	Fine sand, sand	SM, SP-SM	A-3, A-2-4	0	100	80-100	50-85	5-25	---	NP
Newton----------	0-11	Mucky fine sand	SM, SM-SC	A-2-4	0	100	100	50-75	15-30	<20	NP-5
	11-60	Fine sand, sand, loamy fine sand.	SP-SM, SM	A-2-4, A-3	0	100	100	50-75	5-25	---	NP
16B--------------Capac	0-9	Loam-------------	CL, ML, CL-ML	A-4	0-5	95-100	90-100	80-95	60-75	<25	3-10
	9-27	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	50-80	25-40	5-20
	27-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	80-95	60-75	15-35	5-15
17---------------Brookston	0-10	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	60-90	20-30	5-15
	10-46	Clay loam, silty clay loam, loam.	CL	A-6, A-4	0	98-100	85-100	75-95	60-85	25-40	8-20
	46-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	90-100	85-95	78-90	55-70	20-30	5-15
18*. Pits											
19A--------------Brady	0-9	Sandy loam-------	SM, SM-SC	A-2, A-4	0-5	95-100	75-100	60-70	25-40	<25	NP-7
	9-36	Sandy loam, sandy clay loam, loam.	SM, SC, SM-SC	A-2, A-4, A-6	0-5	95-100	75-95	60-80	25-45	15-35	NP-16
	36-55	Loamy sand, sandy loam.	SM	A-2	0-5	95-100	75-95	55-70	15-35	---	NP
	55-60	Gravelly sand, coarse sand, gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-3, A-2-4	0-5	40-75	35-70	20-55	0-10	---	NP
21B*:											
Capac-----------	0-9	Loam-------------	CL, ML, CL-ML	A-4	0-5	95-100	90-100	80-95	60-75	<25	3-10
	9-27	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	50-80	25-40	5-20
	27-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	80-95	60-75	15-35	5-15
Wixom-----------	0-10	Loamy sand-------	SM	A-2-4	0	95-100	95-100	50-70	15-30	---	NP
	10-26	Loamy sand, sand, loamy fine sand.	SM, SP-SM	A-2-4, A-3	0	95-100	95-100	50-75	5-30	<20	NP-4
	26-60	Silty clay loam, sandy clay loam, loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	51-95	20-40	5-25
22A--------------Matherton	0-8	Loam-------------	ML, CL, CL-ML	A-4	0-5	90-100	80-100	80-95	50-90	20-30	NP-8
	8-26	Sandy clay loam, gravelly clay loam, clay loam.	SC, CL, CL-ML, SM-SC	A-6, A-4	0-5	90-100	65-95	50-85	35-70	25-40	5-20
	26-60	Gravelly sand, sand.	GP, SP, SP-SM, GP-GM	A-1, A-3, A-2-4	0-10	40-100	35-90	30-55	0-10	---	NP

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
23---------------- Sebewa	0-10	Loam--------------	CL, CL-ML, ML	A-4, A-6	0	95-100	80-100	75-95	50-90	15-30	3-15
	10-25	Sandy clay loam, loam, gravelly clay loam.	SC, CL	A-4, A-6	0	95-100	65-95	55-85	40-75	25-40	8-20
	25-60	Gravelly sand, sand.	SP, SP-SM, GP, GP-GM	A-1	0-5	40-75	35-70	20-40	0-10	---	NP
26A--------------- Pipestone	0-16	Sand--------------	SP, SM, SP-SM	A-2-4, A-3	0	95-100	90-100	60-80	0-20	---	NP
	16-24	Sand, loamy sand, fine sand.	SP-SM, SP, SM	A-2-4, A-3	0	95-100	90-100	60-80	0-15	---	NP
	24-60	Sand, fine sand, loamy coarse sand.	SP-SM, SP	A-3, A-2-4	0	95-100	90-100	50-80	0-10	---	NP
27B, 27C--------- Metea	0-12	Loamy fine sand	SM	A-2-4	0	100	100	50-80	15-35	---	NP
	12-25	Loamy sand, loamy fine sand, sand.	SP-SM, SM	A-2-4, A-3	0	100	100	50-80	5-35	---	NP
	25-41	Clay loam, fine sandy loam, sandy loam.	SC, SM-SC, CL, CL-ML	A-4, A-2-4	0	95-100	95-100	55-90	15-75	<27	4-9
	41-60	Loam, clay loam	CL	A-6	0-3	95-100	85-90	75-90	50-80	30-40	10-15
28A--------------- Rimer	0-11	Loamy sand--------	SM, ML	A-2, A-4, A-1	0	100	95-100	45-80	15-55	---	NP
	11-22	Loamy fine sand, fine sand, loamy sand.	SM	A-2, A-4	0	100	95-100	75-90	20-40	---	NP
	22-33	Fine sandy loam, sandy loam.	SM, SM-SC, SC	A-4	0	100	95-100	60-80	35-50	15-30	NP-10
	33-60	Clay, silty clay, silty clay loam.	CH, CL, MH, ML	A-7, A-6	0	100	90-100	85-100	75-95	35-60	15-30
29---------------- Cohoctah	0-12	Silt loam---------	ML, OL	A-4	0	100	100	85-100	55-90	<30	NP-6
	12-42	Loam, fine sandy loam, sandy loam.	ML, SM, SC, CL	A-4, A-2	0	95-100	80-100	70-90	30-70	<30	NP-10
	42-60	Loam, sandy loam, loamy sand.	ML, SM, SC, CL	A-4, A-2	0	95-100	80-100	65-90	20-70	<30	NP-10
30---------------- Colwood	0-12	Silt loam---------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	60-90	15-35	2-12
	12-32	Loam, silty clay loam, silt loam.	CL, CL-ML	A-6, A-4	0	100	100	80-100	50-90	20-40	6-20
	32-60	Stratified silt loam to fine sand.	SM, ML	A-2, A-4	0	100	95-100	70-100	30-80	<35	NP-10
31B, 31C, 31D, 31E------------- Tekenink	0-10	Loamy fine sand	SM, SM-SC	A-2-4, A-4, A-1-b	0-10	95-100	80-100	45-95	15-40	<25	NP-6
	10-24	Fine sandy loam, sandy loam, loamy fine sand.	SM, SM-SC, SC	A-4, A-2-4	0-10	95-100	80-100	50-85	20-50	<25	NP-10
	24-50	Fine sandy loam, sandy loam, sandy clay loam.	SM-SC, SC, CL, CL-ML	A-4, A-2-4, A-2-6, A-6	0-10	95-100	80-100	55-85	25-55	<30	4-15
	50-60	Sandy loam, fine sandy loam, loamy fine sand.	SM, SC, SM-SC	A-4, A-2-4	0-10	95-100	80-100	50-95	20-45	<25	NP-10

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
33A-------------- Kibbie	0-9	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	100	100	75-95	40-60	18-25	2-7
	9-25	Silt loam, clay loam, loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-7	0	90-100	85-100	80-100	35-90	25-45	6-25
	25-60	Stratified silt loam to fine sand.	ML, SM, SC, CL	A-4, A-2	0	100	95-100	70-95	30-80	<30	NP-10
34. Aquents											
36-------------- Corunna	0-11	Sandy loam-------	SM, ML, SC, CL	A-2, A-4	0-5	95-100	95-100	65-85	25-70	<30	NP-10
	11-33	Sandy loam, loamy sand, loam.	SM, SC, SM-SC	A-4, A-2	0-5	95-100	95-100	50-75	15-40	<30	NP-10
	33-60	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0	100	95-100	90-100	70-90	25-50	11-25
39-------------- Granby	0-11	Loamy sand-------	SM	A-2	0	100	100	50-75	15-30	---	NP
	11-26	Sand, fine sand, loamy sand.	SP, SP-SM, SM	A-3, A-2	0	100	95-100	50-75	0-20	---	NP
	26-60	Sand, fine sand	SP, SP-SM	A-3, A-2	0	100	95-100	50-70	0-5	---	NP
41B------------- Blount	0-6	Silt loam--------	CL	A-6, A-4	0-5	95-100	95-100	90-100	80-95	25-40	8-20
	6-30	Silty clay loam, silty clay, clay loam.	CH, CL	A-7, A-6	0-5	95-100	90-100	80-90	75-85	35-60	15-35
	30-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	90-100	90-100	80-100	70-90	30-45	10-25
42B------------- Metamora	0-15	Sandy loam-------	SM, SM-SC	A-2, A-4	0-5	95-100	95-100	60-80	25-45	<25	NP-7
	15-20	Sandy loam, loamy sand.	SM, SM-SC	A-2, A-4	0-5	95-100	90-100	50-80	15-45	<25	NP-7
	20-28	Clay loam, loam, sandy clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	90-100	80-100	60-85	20-45	5-25
	28-60	Clay loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	90-100	80-100	60-85	20-45	5-25
44B, 44C, 44D, 44E------------- Chelsea	0-4	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-80	10-35	---	NP
	4-70	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-80	3-15	---	NP
45-------------- Pewamo	0-10	Silt loam--------	ML, CL, CL-ML	A-4	0-5	90-100	80-100	80-95	60-85	20-35	3-10
	10-30	Clay loam, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	95-100	90-100	90-100	75-95	35-55	15-30
	30-60	Clay loam, silty clay loam.	CL	A-7	0-5	95-100	90-100	90-100	70-90	40-50	15-25
47-------------- Napoleon	0-3	Sapric material	PT	A-8	0	---	---	---	---	---	---
	3-60	Hemic material---	PT	A-8	0	---	---	---	---	---	---
48-------------- Belleville	0-13	Loamy sand-------	SM	A-2	0	100	95-100	70-85	20-35	<20	NP-4
	13-32	Sand, loamy sand, loamy fine sand.	SM	A-2	0-3	95-100	90-100	50-85	15-30	<20	NP-4
	32-60	Clay loam, silt loam, loam.	CL	A-6, A-7	0-3	95-100	90-100	90-100	70-90	25-50	10-25

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
49A-------------- Tedrow	0-10	Fine sand--------	SM	A-2	0	100	95-100	60-80	20-35	---	NP
	10-34	Loamy fine sand, loamy sand, fine sand.	SM, SP-SM	A-2, A-3	0	100	95-100	60-80	5-35	---	NP
	34-60	Sand, fine sand	SM, SP, SP-SM	A-2, A-3	0	100	95-100	50-70	3-35	---	NP
50*: Aquents.											
Histosols.											
51A-------------- Thetford	0-17	Loamy fine sand	SM	A-2, A-4	0	95-100	90-100	70-85	20-45	<20	NP-4
	17-49	Loamy sand, sandy loam.	SM	A-2, A-4	0	95-100	90-100	60-80	20-40	<20	NP-4
	49-60	Very fine sand, fine sand, sand.	SM, SP, SP-SM	A-2, A-4, A-3	0	95-100	70-100	50-85	0-45	<20	NP-4
53B-------------- Oakville	0-9	Fine sand--------	SM	A-2	0	100	100	55-75	15-25	---	NP
	9-52	Fine sand, loamy fine sand, sand.	SM, SP, SP-SM	A-2, A-3	0	100	100	65-95	0-35	---	NP
	52-60	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	25-50	12-30
57A-------------- Covert	0-3	Sand-------------	SP-SM, SM	A-3, A-2-4	0	95-100	90-100	50-75	5-15	---	NP
	3-34	Sand-------------	SP-SM, SM	A-3, A-2-4	0	95-100	90-100	50-70	5-15	---	NP
	34-60	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	95-100	90-100	50-70	5-15	---	NP
60B-------------- Seward	0-11	Loamy fine sand	SM, ML	A-2, A-4, A-1	0	100	95-100	45-80	15-55	---	NP
	11-30	Loamy fine sand, fine sand, loamy sand.	SM, ML	A-2, A-4, A-1	0	100	95-100	45-80	15-55	---	NP
	30-39	Fine sandy loam, sandy loam.	SM	A-4	0	100	90-100	60-80	35-50	<40	NP-10
	39-60	Clay, silty clay, silty clay loam.	CH, CL	A-7	0	100	90-100	85-100	75-95	40-65	20-38
62--------------- Sloan	0-10	Silt loam--------	CL, ML, CL-ML	A-6, A-4	0	100	95-100	85-100	70-95	20-40	3-15
	10-34	Silty clay loam, clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	75-95	30-45	8-18
	34-60	Stratified gravelly sandy loam to silty clay loam.	ML, CL	A-4, A-6	0	95-100	70-100	60-95	50-90	25-40	3-15
63B, 63C--------- Riddles	0-8	Loam-------------	CL	A-4, A-6	0	95-100	85-95	80-90	60-75	20-35	8-15
	8-70	Clay loam, sandy clay loam.	CL	A-6, A-7	0	90-100	80-95	75-95	65-75	35-50	15-30
64*: Belleville------	0-13	Loamy sand-------	SM	A-2	0	100	95-100	70-85	20-35	<20	NP-4
	13-32	Sand, loamy sand, loamy fine sand.	SM	A-2	0-3	95-100	90-100	50-85	15-30	<20	NP-4
	32-60	Clay loam, silt loam, loam.	CL	A-6, A-7	0-3	95-100	90-100	90-100	70-90	25-50	10-25

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
64*:											
Brookston--------	0-10	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	60-90	20-30	5-15
	10-46	Clay loam, silty clay loam, loam.	CL	A-6, A-4	0	98-100	85-100	75-95	60-85	25-40	8-20
	46-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	90-100	85-95	78-90	55-70	20-30	5-15
65--------------- Cohoctah	0-9	Silt loam--------	ML, CL-ML	A-4	0	100	100	85-100	60-90	<25	NP-6
	9-49	Stratified very fine sandy loam to loam.	ML, SM, SC, CL	A-4, A-2	0	95-100	80-100	70-90	30-70	<30	NP-10
	49-60	Loam, sandy loam, loamy sand.	ML, SM, SC, CL	A-4, A-2	0	95-100	80-100	65-90	20-70	<30	NP-10
66. Udipsamments											
67--------------- Martisco	0-11	Sapric material	PT	A-8	0	---	---	---	---	---	---
	11-60	Marl-------------	---	---	0	---	---	---	---	---	---
69--------------- Newton	0-11	Mucky fine sand	SM, SM-SC	A-2-4	0	100	100	50-75	15-30	<20	NP-5
	11-60	Fine sand, sand, loamy fine sand.	SP-SM, SM	A-2-4, A-3	0	100	100	50-75	5-25	---	NP
70A-------------- Morocco	0-3	Fine sand--------	SM, SM-SC	A-2-4	0	100	100	65-85	20-35	<20	NP-5
	3-60	Fine sand, sand	SM, SP-SM	A-3, A-2-4	0	100	80-100	50-85	5-25	---	NP
72B*: Urban land.											
Oakville---------	0-9	Fine sand--------	SM, SP, SP-SM	A-2, A-3	0	100	100	50-85	0-35	---	NP
	9-60	Fine sand, sand, loamy fine sand.	SM, SP, SP-SM	A-2, A-3	0	100	95-100	65-95	0-25	---	NP
73A-------------- Algansee	0-9	Loamy sand-------	SM	A-2-4	0	100	100	50-75	15-30	---	NP
	9-60	Stratified sand to loam.	SM, SP-SM	A-3, A-2-4	0	100	100	50-70	5-15	---	NP
74--------------- Glendora	0-8	Loamy sand-------	SM	A-2-4	0-5	95-100	90-100	50-75	15-30	---	NP
	8-60	Stratified sand to loamy fine sand.	SP, SM, SP-SM	A-3, A-2-4, A-1-b	0-5	95-100	90-100	45-75	0-20	---	NP
75B*:											
Marlette---------	0-10	Loam-------------	CL-ML, ML, CL, SC	A-4	0-5	95-100	85-95	70-95	40-70	20-30	3-10
	10-38	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	85-95	80-95	55-90	20-40	5-25
	38-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	85-95	75-95	50-75	20-40	5-25
Capac------------	0-9	Loam-------------	CL, ML, CL-ML	A-4	0-5	95-100	90-100	80-95	60-75	<25	3-10
	9-27	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	50-80	25-40	5-20
	27-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	80-95	60-75	15-35	5-15

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
2----------------	0-11	0-15	1.35-1.50	2.0-20	0.07-0.15	5.6-7.8	Low-----------	0.17	5	2	---
Glendora	11-60	0-10	1.40-1.65	6.0-20	0.05-0.11	5.6-7.8	Low-----------	0.17			
4*:											
Dune land.											
Beaches.											
5----------------	0-60	---	0.15-0.45	0.2-6.0	0.35-0.45	4.5-7.8	-------------	----	2	2	>70
Houghton											
6----------------	0-34	---	0.30-0.55	0.2-6.0	0.35-0.45	5.1-7.8	-------------	----	2	2	55-75
Adrian	34-60	2-10	1.40-1.75	6.0-20	0.03-0.08	5.6-8.4	Low-----------	----			
7----------------	0-22	---	0.25-0.45	0.2-6.0	0.35-0.45	5.1-7.8	-------------	----	2	2	>75
Palms	22-60	7-35	1.45-1.75	0.2-2.0	0.14-0.22	6.1-8.4	Low-----------	----			
8B, 8C-----------	0-10	27-38	1.35-1.55	0.2-0.6	0.17-0.23	5.6-7.3	Low-----------	0.43	2	6	1-2
Glynwood	10-29	35-55	1.45-1.75	0.06-0.2	0.11-0.18	4.5-7.8	Moderate-----	0.32			
	29-60	27-36	1.65-1.85	0.06-0.2	0.06-0.10	7.4-8.4	Moderate-----	0.32			
10B, 10C, 10E----	0-9	0-10	1.30-1.55	6.0-20	0.07-0.09	5.6-7.3	Low-----------	0.15	5	1	.5-2
Oakville	9-60	0-10	1.30-1.65	6.0-20	0.06-0.10	5.6-7.3	Low-----------	0.15			
11B*, 11C*, 11D*, 11E*:											
Oshtemo--------	0-10	2-12	1.20-1.60	6.0-20	0.10-0.12	5.1-6.5	Low-----------	0.17	5	2	.5-3
	10-35	10-18	1.20-1.60	2.0-6.0	0.12-0.19	5.1-6.5	Low-----------	0.24			
	35-60	5-15	1.20-1.60	2.0-6.0	0.06-0.10	5.1-7.3	Low-----------	0.17			
Chelsea---------	0-4	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low-----------	0.17	5	2	.5-1
	4-70	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-5.5	Low-----------	0.17			
12B, 12C, 12D, 12E-------------	0-11	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-6.5	Low-----------	0.37	5	5	.5-3
Ockley	11-42	20-35	1.45-1.60	0.6-2.0	0.15-0.22	4.5-6.0	Moderate-----	0.37			
	42-60	2-5	1.60-1.80	>20	0.02-0.04	7.4-8.4	Low-----------	0.10			
14C, 14D, 14E----	0-10	10-18	1.30-1.65	2.0-6.0	0.18-0.22	5.6-7.3	Low-----------	0.32	5	5	1-3
Marlette	10-38	18-30	1.30-1.70	0.2-0.6	0.18-0.20	5.6-7.8	Low-----------	0.32			
	38-60	15-25	1.30-1.70	0.2-0.6	0.12-0.19	7.9-8.4	Low-----------	0.32			
15B*:											
Morocco---------	0-3	1-6	1.45-1.65	6.0-20	0.07-0.09	5.1-6.5	Low-----------	0.15	5	1	.5-2
	3-60	1-6	1.50-1.70	6.0-20	0.05-0.07	4.5-6.0	Low-----------	0.15			
Newton----------	0-11	3-7	1.45-1.60	6.0-20	0.10-0.12	5.1-6.0	Low-----------	0.17	5	2	2-4
	11-60	2-7	1.60-1.75	6.0-20	0.05-0.07	4.5-5.5	Low-----------	0.17			
16B--------------	0-9	10-18	1.40-1.70	0.6-2.0	0.18-0.20	5.6-7.3	Low-----------	0.32	5	5	1-3
Capac	9-27	18-35	1.45-1.70	0.2-0.6	0.14-0.18	5.6-7.3	Low-----------	0.32			
	27-60	10-35	1.50-1.70	0.2-0.6	0.14-0.16	7.4-8.4	Low-----------	0.32			
17---------------	0-10	14-27	1.35-1.50	0.6-2.0	0.21-0.24	6.1-7.3	Low-----------	0.28	5	6	3-5
Brookston	10-46	20-35	1.40-1.60	0.6-2.0	0.15-0.19	6.1-7.3	Moderate-----	0.28			
	46-60	15-26	1.45-1.70	0.6-2.0	0.05-0.19	7.4-8.4	Low-----------	0.28			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
18*. Pits											
19A---------------- Brady	0-9	2-15	1.25-1.40	2.0-6.0	0.12-0.15	5.6-7.3	Low-----------	0.20	5	3	1-4
	9-36	5-22	1.35-1.45	2.0-6.0	0.12-0.17	5.1-6.5	Low-----------	0.20			
	36-55	5-20	1.25-1.50	2.0-6.0	0.08-0.10	5.1-7.3	Low-----------	0.20			
	55-60	0-10	1.25-1.50	>20	0.02-0.04	6.6-8.4	Low-----------	0.10			
21B*:											
Capac-----------	0-9	10-18	1.40-1.70	0.6-2.0	0.18-0.20	5.6-7.3	Low-----------	0.32	5	5	1-3
	9-27	18-35	1.45-1.70	0.2-0.6	0.14-0.18	5.6-7.3	Low-----------	0.32			
	27-60	10-35	1.50-1.70	0.2-0.6	0.14-0.16	7.4-8.4	Low-----------	0.32			
Wixom-----------	0-10	2-12	1.20-1.60	6.0-20	0.10-0.12	5.1-6.5	Low-----------	0.17	5	2	2-4
	10-26	2-14	1.40-1.70	6.0-20	0.06-0.11	5.1-6.5	Low-----------	0.15			
	26-60	18-35	1.30-1.70	0.2-0.6	0.14-0.20	6.1-7.8	Moderate-----	0.43			
22A--------------- Matherton	0-8	10-20	1.30-1.65	2.0-6.0	0.13-0.24	5.6-7.3	Low-----------	0.28	4	5	2-4
	8-26	20-35	1.40-1.70	0.6-2.0	0.16-0.18	5.6-7.3	Low-----------	0.28			
	26-60	0-10	1.50-1.65	>6.0	0.02-0.04	7.4-8.4	Low-----------	0.10			
23--------------- Sebewa	0-10	10-25	1.10-1.60	0.6-2.0	0.18-0.25	6.1-7.8	Low-----------	0.24	4	5	1-6
	10-25	18-35	1.50-1.80	0.6-2.0	0.15-0.19	6.1-7.8	Low-----------	0.24			
	25-60	0-3	1.55-1.75	6.0-20	0.02-0.04	7.4-8.4	Low-----------	0.10			
26A--------------- Pipestone	0-16	2-12	1.20-1.60	6.0-20	0.07-0.10	4.5-7.3	Low-----------	0.15	5	1	3-4
	16-24	2-12	1.20-1.60	6.0-20	0.06-0.09	4.5-7.3	Low-----------	0.17			
	24-60	2-12	1.20-1.60	6.0-20	0.05-0.07	5.1-7.3	Low-----------	0.17			
27B, 27C--------- Metea	0-12	3-8	1.55-1.65	6.0-20	0.10-0.12	5.6-7.3	Low-----------	0.17	5	2	.5-2
	12-25	2-10	1.65-1.80	6.0-20	0.06-0.11	5.1-6.5	Low-----------	0.17			
	25-41	12-22	1.45-1.55	0.2-0.6	0.15-0.19	5.6-6.5	Low-----------	0.32			
	41-60	27-35	1.45-1.65	0.2-0.6	0.15-0.19	5.6-7.3	Moderate-----	0.32			
28A--------------- Rimer	0-11	3-15	1.40-1.60	6.0-20	0.07-0.12	5.1-7.3	Low-----------	0.17	4	2	1-3
	11-22	5-15	1.40-1.70	6.0-20	0.06-0.11	5.1-7.3	Low-----------	0.17			
	22-33	7-18	1.50-1.70	2.0-6.0	0.12-0.17	5.1-7.3	Low-----------	0.17			
	33-60	35-55	1.50-1.85	<0.2	0.08-0.12	6.1-8.4	High----------	0.32			
29--------------- Cohoctah	0-12	5-20	1.20-1.60	2.0-6.0	0.18-0.30	6.1-7.8	Low-----------	0.28	5	3	1-4
	12-42	5-27	1.45-1.65	2.0-6.0	0.12-0.20	6.1-8.4	Low-----------	0.28			
	42-60	2-25	1.45-1.65	2.0-6.0	0.08-0.20	6.1-8.4	Low-----------	0.28			
30--------------- Colwood	0-12	5-26	1.15-1.60	0.6-2.0	0.20-0.24	6.1-7.8	Low-----------	0.28	5	5	3-8
	12-32	18-35	1.30-1.60	0.6-2.0	0.17-0.22	6.1-8.4	Moderate-----	0.43			
	32-60	0-12	1.20-1.45	0.6-2.0	0.12-0.22	7.4-8.4	Low-----------	0.43			
31B, 31C, 31D, 31E------------- Tekenink	0-10	2-12	1.15-1.60	2.0-6.0	0.08-0.12	5.1-7.3	Low-----------	0.17	5	2	1-3
	10-24	2-15	1.25-1.60	0.6-2.0	0.08-0.17	5.1-7.3	Low-----------	0.24			
	24-50	10-22	1.25-1.70	0.6-2.0	0.10-0.17	5.1-7.3	Low-----------	0.24			
	50-60	2-15	1.30-1.70	0.6-6.0	0.08-0.16	7.4-8.4	Low-----------	0.24			
33A--------------- Kibbie	0-9	2-20	1.40-1.65	0.6-2.0	0.16-0.20	5.6-7.3	Low-----------	0.20	5	3	2-3
	9-25	18-35	1.40-1.65	0.6-2.0	0.17-0.22	5.6-7.3	Low-----------	0.43			
	25-60	2-18	1.40-1.70	0.6-2.0	0.12-0.22	7.4-8.4	Low-----------	0.43			
34. Aquents											
36--------------- Corunna	0-11	5-15	1.60-1.70	0.6-6.0	0.14-0.22	6.1-7.8	Low-----------	0.20	4	3	1-2
	11-33	10-18	1.30-1.60	0.6-6.0	0.08-0.14	6.1-7.8	Low-----------	0.20			
	33-60	18-35	1.45-1.70	0.2-0.6	0.16-0.20	7.4-8.4	Moderate-----	0.43			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
39----------------	0-11	2-14	1.20-1.60	6.0-20	0.10-0.12	5.6-7.3	Low-----------	0.17	5	2	4-6
Granby	11-26	0-14	1.45-1.65	6.0-20	0.05-0.12	5.6-7.8	Low-----------	0.17			
	26-60	0-10	1.45-1.65	6.0-20	0.05-0.09	6.6-8.4	Low-----------	0.17			
41B---------------	0-6	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	Low-----------	0.43	3	6	2-3
Blount	6-30	35-50	1.40-1.70	0.06-0.6	0.12-0.19	4.5-6.5	Moderate------	0.43			
	30-60	27-38	1.60-1.85	0.06-0.6	0.07-0.10	7.4-8.4	Moderate------	0.43			
42B---------------	0-15	5-15	1.25-1.40	2.0-6.0	0.14-0.18	5.1-7.3	Low-----------	0.20	5	3	1-2
Metamora	15-20	5-15	1.40-1.60	2.0-6.0	0.10-0.15	5.1-7.3	Low-----------	0.20			
	20-28	18-35	1.45-1.70	0.2-0.6	0.16-0.18	6.1-7.3	Moderate------	0.32			
	28-60	12-30	1.45-1.70	0.2-0.6	0.14-0.18	6.6-8.4	Moderate------	0.32			
44B, 44C, 44D,											
44E-------------	0-4	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low-----------	0.17	5	2	.5-1
Chelsea	4-70	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-5.5	Low-----------	0.17			
45----------------	0-10	18-27	1.35-1.55	0.6-2.0	0.20-0.22	6.1-7.3	Low-----------	0.28	5	5	3-5
Pewamo	10-30	35-50	1.40-1.70	0.06-0.6	0.12-0.20	5.6-7.8	Moderate------	0.28			
	30-60	30-40	1.50-1.75	0.06-0.6	0.14-0.18	7.4-8.4	Moderate------	0.28			
47----------------	0-3	---	0.30-0.40	0.2-6.0	0.35-0.45	<4.5	--------------	----	2	2	70-90
Napoleon	3-60	---	0.10-0.20	0.6-6.0	0.45-0.55	<4.5	--------------	----			
48----------------	0-13	3-12	0.90-1.60	6.0-20	0.10-0.12	6.1-7.8	Low-----------	0.17	5	2	.5-3
Belleville	13-32	2-12	1.45-1.70	6.0-20	0.06-0.10	6.1-8.4	Low-----------	0.17			
	32-60	25-35	1.45-1.95	0.2-0.6	0.14-0.20	7.4-8.4	Moderate------	0.32			
49A---------------	0-10	2-10	1.40-1.60	6.0-20	0.08-0.12	6.1-7.3	Low-----------	0.17	5	2	1-3
Tedrow	10-34	2-8	1.50-1.70	6.0-20	0.07-0.11	5.6-7.8	Low-----------	0.17			
	34-60	1-8	1.50-1.70	6.0-20	0.05-0.07	6.6-8.4	Low-----------	0.17			
50*:											
Aquents.											
Histosols.											
51A---------------	0-17	2-15	1.25-1.41	2.0-6.0	0.10-0.13	5.6-7.3	Low-----------	0.17	5	2	1-4
Thetford	17-49	8-18	1.35-1.45	2.0-6.0	0.08-0.13	5.6-7.8	Low-----------	0.17			
	49-60	0-10	1.25-1.50	6.0-20	0.05-0.08	7.4-8.4	Low-----------	0.17			
53B---------------	0-9	2-14	1.30-1.55	6.0-20	0.07-0.09	5.6-7.3	Low-----------	0.15	5	1	.5-2
Oakville	9-52	0-10	1.30-1.60	6.0-20	0.06-0.10	5.6-7.3	Low-----------	0.15			
	52-60	27-35	1.60-1.75	0.2-0.6	0.14-0.20	7.9-8.4	Moderate------	0.37			
57A---------------	0-3	2-10	1.25-1.55	6.0-20	0.06-0.09	4.5-7.3	Low-----------	0.15	5	1	1-2
Covert	3-34	2-10	1.25-1.60	6.0-20	0.05-0.08	4.5-7.3	Low-----------	0.15			
	34-60	0-10	1.45-1.65	6.0-20	0.04-0.07	5.1-7.3	Low-----------	0.15			
60B---------------	0-11	3-15	1.40-1.60	6.0-20	0.08-0.10	5.1-7.3	Low-----------	0.17	4	2	.5-3
Seward	11-30	2-15	1.40-1.60	6.0-20	0.05-0.09	5.1-7.3	Low-----------	0.17			
	30-39	5-18	1.50-1.70	2.0-6.0	0.10-0.16	5.1-7.3	Low-----------	0.17			
	39-60	35-55	1.60-1.82	<0.2	0.06-0.12	6.1-8.4	High----------	0.32			
62----------------	0-10	15-27	1.20-1.40	0.6-2.0	0.20-0.24	6.1-7.8	Low-----------	0.37	5	6	3-6
Sloan	10-34	22-35	1.25-1.55	0.2-2.0	0.15-0.19	6.1-8.4	Moderate------	0.37			
	34-60	10-30	1.20-1.50	0.2-2.0	0.13-0.18	6.6-8.4	Low-----------	0.37			
63B, 63C----------	0-8	8-16	1.30-1.50	0.6-2.0	0.20-0.24	6.1-7.3	Low-----------	0.32	5	5	.5-2
Riddles	8-70	20-35	1.40-1.60	0.6-2.0	0.15-0.19	5.1-7.3	Moderate------	0.32			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
64*:											
Belleville------	0-13	3-12	0.90-1.60	6.0-20	0.10-0.12	6.1-7.8	Low-----------	0.17	5	2	.5-3
	13-32	2-12	1.45-1.70	6.0-20	0.06-0.10	6.1-8.4	Low-----------	0.17			
	32-60	25-35	1.45-1.95	0.2-0.6	0.14-0.20	7.4-8.4	Moderate------	0.32			
Brookston-------	0-10	14-27	1.35-1.50	0.6-2.0	0.21-0.24	6.1-7.3	Low-----------	0.28	5	6	3-5
	10-46	20-35	1.40-1.60	0.6-2.0	0.15-0.19	6.1-7.3	Moderate------	0.28			
	46-60	15-26	1.45-1.70	0.6-2.0	0.05-0.19	7.4-8.4	Low-----------	0.28			
65--------------- Cohoctah	0-9	5-20	1.20-1.60	2.0-6.0	0.18-0.24	6.1-7.8	Low-----------	0.28	5	5	1-4
	9-49	5-25	1.45-1.65	2.0-6.0	0.12-0.20	5.1-8.4	Low-----------	0.28			
	49-60	2-25	1.45-1.65	2.0-6.0	0.08-0.20	6.1-8.4	Low-----------	0.28			
66. Udipsamments											
67--------------- Martisco	0-11	---	0.13-0.23	0.6-6.0	0.35-0.45	6.1-8.4	--------------	----	---	2	25-75
	11-60	---	---	0.06-0.2	---	7.9-8.4	Low-----------	----			
69--------------- Newton	0-11	3-7	1.45-1.60	6.0-20	0.10-0.12	5.1-6.0	Low-----------	0.17	5	2	2-4
	11-60	2-7	1.60-1.75	6.0-20	0.05-0.07	4.5-5.5	Low-----------	0.17			
70A-------------- Morocco	0-3	1-6	1.45-1.65	6.0-20	0.07-0.09	5.1-6.5	Low-----------	0.15	5	1	.5-2
	3-60	1-6	1.50-1.70	6.0-20	0.05-0.07	4.5-6.0	Low-----------	0.15			
72B*: Urban land.											
Oakville--------	0-9	0-10	1.30-1.55	6.0-20	0.07-0.09	5.6-7.3	Low-----------	0.15	5	1	.5-2
	9-60	0-10	1.30-1.65	6.0-20	0.06-0.10	5.6-7.3	Low-----------	0.15			
73A-------------- Algansee	0-9	0-15	1.35-1.50	6.0-20	0.09-0.12	5.6-7.3	Low-----------	0.17	5	2	1-4
	9-60	10-60	1.40-1.65	6.0-20	0.05-0.07	5.6-7.8	Low-----------	0.17			
74--------------- Glendora	0-8	2-15	1.35-1.50	2.0-20	0.10-0.15	6.1-7.8	Low-----------	0.17	5	2	4-6
	8-60	0-10	1.35-1.50	6.0-20	0.07-0.10	6.1-7.8	Low-----------	0.17			
75B*:											
Marlette--------	0-10	10-18	1.30-1.65	2.0-6.0	0.18-0.22	5.6-7.3	Low-----------	0.32	5	5	1-3
	10-38	18-30	1.30-1.70	0.2-0.6	0.18-0.20	5.6-7.8	Low-----------	0.32			
	38-60	15-25	1.30-1.70	0.2-0.6	0.12-0.19	7.9-8.4	Low-----------	0.32			
Capac-----------	0-9	10-18	1.40-1.70	0.6-2.0	0.18-0.20	5.6-7.3	Low-----------	0.32	5	5	1-3
	9-27	18-35	1.45-1.70	0.2-0.6	0.14-0.18	5.6-7.3	Low-----------	0.32			
	27-60	10-35	1.50-1.70	0.2-0.6	0.14-0.16	7.4-8.4	Low-----------	0.32			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the te
< means less than; > means more than. Absence of an entry indicates that the feature is not a concern or tha
estimated]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Total subsidence	Potential frost action	Ri
		Frequency	Duration	Months	Depth	Kind	Months			Unc s
					Ft			In		
2----------------- Glendora	A/D	Frequent----	Long------	Jan-Dec	0-1.0	Apparent	Nov-Jun	---	Moderate	Hig
4*: Dune land.										
Beaches.										
5----------------- Houghton	A/D	None--------	---	---	+1-1.0	Apparent	Sep-Jun	55-60	High-----	Hig
6----------------- Adrian	A/D	None--------	---	---	+1-1.0	Apparent	Nov-May	29-33	High-----	Hig
7----------------- Palms	A/D	None--------	---	---	+1-1.0	Apparent	Nov-May	25-32	High-----	Hig
8B, 8C------------ Glynwood	C	None--------	---	---	2.0-3.5	Perched	Jan-Apr	---	High-----	Hig
10B, 10C, 10E----- Oakville	A	None--------	---	---	>6.0	---	---	---	Low------	Low
11B*, 11C*, 11D*, 11E*: Oshtemo---------	B	None--------	---	---	>6.0	---	---	---	Low------	Low
Chelsea---------	A	None--------	---	---	>6.0	---	---	---	Low------	Low
12B, 12C, 12D, 12E------------- Ockley	B	None--------	---	---	>6.0	---	---	---	Moderate	Mod
14C, 14D, 14E----- Marlette	B	None--------	---	---	>6.0	---	---	---	Moderate	Low
15B*: Morocco----------	B	None--------	---	---	1.0-2.0	Apparent	Nov-Apr	---	Moderate	Low
Newton-----------	A/D	None--------	---	---	+.5-1.0	Apparent	Nov-May	---	Moderate	Hig
16B-------------- Capac	C	None--------	---	---	1.0-2.0	Apparent	Nov-May	---	High-----	Hig

See footnote at end of table.

TABLE 19.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Total subsidence	Potential frost action	R
		Frequency	Duration	Months	Depth	Kind	Months			Un
					Ft			In		
17---------------- Brookston	B/D	None---------	---	---	+.5-1.0	Apparent	Nov-May	---	High-----	Hi
18*. Pits										
19A--------------- Brady	B	None---------	---	---	1.0-3.0	Apparent	Nov-May	---	High-----	Lo
21B*: Capac------------	C	None---------	---	---	1.0-2.0	Apparent	Nov-May	---	High-----	Hi
Wixom------------	B	None---------	---	---	0.5-1.5	Perched	Nov-Jun	---	Moderate	Mo
22A--------------- Matherton	B	None---------	---	---	1.0-2.0	Apparent	Nov-May	---	High-----	Mo
23---------------- Sebewa	B/D	None---------	---	---	+1-1.0	Apparent	Sep-May	---	High-----	Hi
26A--------------- Pipestone	B	None---------	---	---	0.5-1.5	Apparent	Oct-Jun	---	Moderate	Lo
27B, 27C---------- Metea	B	None---------	---	---	>6.0	---	---	---	Moderate	Mo
28A--------------- Rimer	C	None---------	---	---	1.0-2.5	Perched	Nov-Apr	---	High-----	Hi
29---------------- Cohoctah	B/D	Frequent----	Brief to long.	Nov-Apr	0-1.0	Apparent	Sep-May	---	High-----	Hi
30---------------- Colwood	B/D	None---------	---	---	+1-1.0	Apparent	Oct-May	---	High-----	Hi
31B, 31C, 31D, 31E--------------- Tekenink	B	None---------	---	---	>6.0	---	---	---	Moderate	Lo
33A--------------- Kibbie	B	None---------	---	---	1.0-2.0	Apparent	Nov-May	---	High-----	Lo
34. Aquents										
36---------------- Corunna	B/D	None---------	---	---	+1-1.0	Apparent	Nov-May	---	High-----	Hi
39---------------- Granby	A/D	None---------	---	---	+1-1.0	Apparent	Nov-Jun	---	Moderate	Hi

See footnote at end of table.

TABLE 19.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Total subsidence	Potential frost action	Ri
		Frequency	Duration	Months	Depth	Kind	Months			Unc
					Ft			In		
41B---------------- Blount	C	None---------	---	---	1.0-3.0	Perched	Nov-May	---	High-----	Hi
42B---------------- Metamora	B	None---------	---	---	1.0-2.0	Apparent	Nov-May	---	High-----	Mo
44B, 44C, 44D, 44E------------- Chelsea	A	None---------	---	---	>6.0	---	---	---	Low------	Lo
45----------------- Pewamo	C/D	None---------	---	---	+1-1.0	Apparent	Dec-May	---	High-----	Hi
47----------------- Napoleon	A/D	None---------	---	---	+1-1.0	Apparent	Sep-Jun	50-59	High-----	Mo
48----------------- Belleville	B/D	None---------	---	---	+1-1.0	Apparent	Nov-May	---	High-----	Hi
49A---------------- Tedrow	B	None---------	---	---	1.0-2.0	Apparent	Dec-Apr	---	Moderate	Lo
50*: Aquents.										
Histosols.										
51A---------------- Thetford	A	None---------	---	---	1.0-2.0	Apparent	Nov-May	---	Moderate	Lo
53B---------------- Oakville	A	None---------	---	---	3.0-6.0	Apparent	Nov-Apr	---	Low------	Lo
57A---------------- Covert	A	None---------	---	---	2.0-3.5	Apparent	Nov-Apr	---	Low------	Lo
60B---------------- Seward	B	None---------	---	---	2.0-3.5	Perched	Nov-Apr	---	Moderate	Hi
62----------------- Sloan	B/D	Frequent----	Brief-----	Nov-Jun	0-1.0	Apparent	Nov-Jun	---	High-----	Hi
63B, 63C----------- Riddles	B	None---------	---	---	>6.0	---	---	---	Moderate	Mo
64*: Belleville--------	B/D	None---------	---	---	+1-1.0	Apparent	Nov-May	---	High-----	Hi
Brookston---------	B/D	None---------	---	---	+.5-1.0	Apparent	Nov-May	---	High-----	Hi

See footnote at end of table.

TABLE 19.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Total subsidence	Potential frost action	
		Frequency	Duration	Months	Depth	Kind	Months			Un
					<u>Ft</u>			<u>In</u>		
65---------------- Cohoctah	B/D	Rare---------	---	---	+.5-1.0	Apparent	Sep-May	---	High-----	Hi
66. Udipsamments										
67---------------- Martisco	B/D	None---------	---	---	+1-0.5	Apparent	Oct-Jun	4-6	High-----	Hi
69---------------- Newton	A/D	None---------	---	---	+.5-1.0	Apparent	Nov-May	---	Moderate	Hi
70A--------------- Morocco	B	None---------	---	---	1.0-2.0	Apparent	Nov-Apr	---	Moderate	Lo
72B*: Urban land.										
Oakville----------	A	None---------	---	---	>6.0	---	---	---	Low------	Lo
73A--------------- Algansee	B	Rare---------	---	---	1.0-2.0	Apparent	Nov-May	---	Moderate	Lo
74---------------- Glendora	A/D	Rare---------	---	---	+.5-1.0	Apparent	Nov-May	---	Moderate	Hi
75B*: Marlette----------	B	None---------	---	---	2.5-6.0	Apparent	Dec-Apr	---	Moderate	Lo
Capac-------------	C	None---------	---	---	1.0-2.0	Apparent	Nov-May	---	High-----	Hi

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 20.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Adrian	Sandy or sandy-skeletal, mixed, euic, mesic Terric Medisaprists
Algansee	Mixed, mesic Aquic Udipsamments
Aquents	Mixed, mesic Aquents
Belleville	Sandy over loamy, mixed, mesic Typic Haplaquolls
Blount	Fine, illitic, mesic Aeric Ochraqualfs
Brady	Coarse-loamy, mixed, mesic Aquollic Hapludalfs
Brookston	Fine-loamy, mixed, mesic Typic Argiaquolls
Capac	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Chelsea	Mixed, mesic Alfic Udipsamments
Cohoctah	Coarse-loamy, mixed, mesic Fluvaquentic Haplaquolls
Colwood	Fine-loamy, mixed, mesic Typic Haplaquolls
Corunna	Coarse-loamy, mixed, mesic Typic Haplaquolls
*Covert	Sandy, mixed, mesic Entic Haplorthods
Glendora	Mixed, mesic Mollic Psammaquents
Glynwood	Fine, illitic, mesic Aquic Hapludalfs
Granby	Sandy, mixed, mesic Typic Haplaquolls
Histosols	Mesic Histosols
Houghton	Euic, mesic Typic Medisaprists
Kibbie	Fine-loamy, mixed, mesic Aquollic Hapludalfs
Marlette	Fine-loamy, mixed, mesic Glossoboric Hapludalfs
Martisco	Fine-silty, carbonatic, mesic Histic Humaquepts
Matherton	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Udollic Ochraqualfs
Metamora	Fine-loamy, mixed, mesic Udollic Ochraqualfs
Metea	Loamy, mixed, mesic Arenic Hapludalfs
Morocco	Mixed, mesic Aquic Udipsamments
Napoleon	Dysic, mesic Typic Medihemists
Newton	Sandy, mixed, mesic Typic Humaquepts
Oakville	Mixed, mesic Typic Udipsamments
Ockley	Fine-loamy, mixed, mesic Typic Hapludalfs
Oshtemo	Coarse-loamy, mixed, mesic Typic Hapludalfs
Palms	Loamy, mixed, euic, mesic Terric Medisaprists
Pewamo	Fine, mixed, mesic Typic Argiaquolls
Pipestone	Sandy, mixed, mesic Entic Haplaquods
*Riddles	Fine-loamy, mixed, mesic Typic Hapludalfs
Rimer	Loamy, mixed, mesic Aquic Arenic Hapludalfs
Sebewa	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Argiaquolls
Seward	Loamy, mixed, mesic Arenic Hapludalfs
Sloan	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Tedrow	Mixed, mesic Aquic Udipsamments
Tekenink	Coarse-loamy, mixed, mesic Glossoboric Hapludalfs
Thetford	Sandy, mixed, mesic Psammaquentic Hapludalfs
Udipsamments	Mixed, mesic Udipsamments
Wixom	Sandy over loamy, mixed, mesic Alfic Haplaquods

☆ U.S. GOVERNMENT PRINTING OFFICE : 1987 O - 488-809 : QL 3

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

Nondiscrimination Statement

Nondiscrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

To File an Employment Complaint

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (http://directives.sc.egov.usda.gov/33081.wba) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to program.intake@usda.gov.

Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for

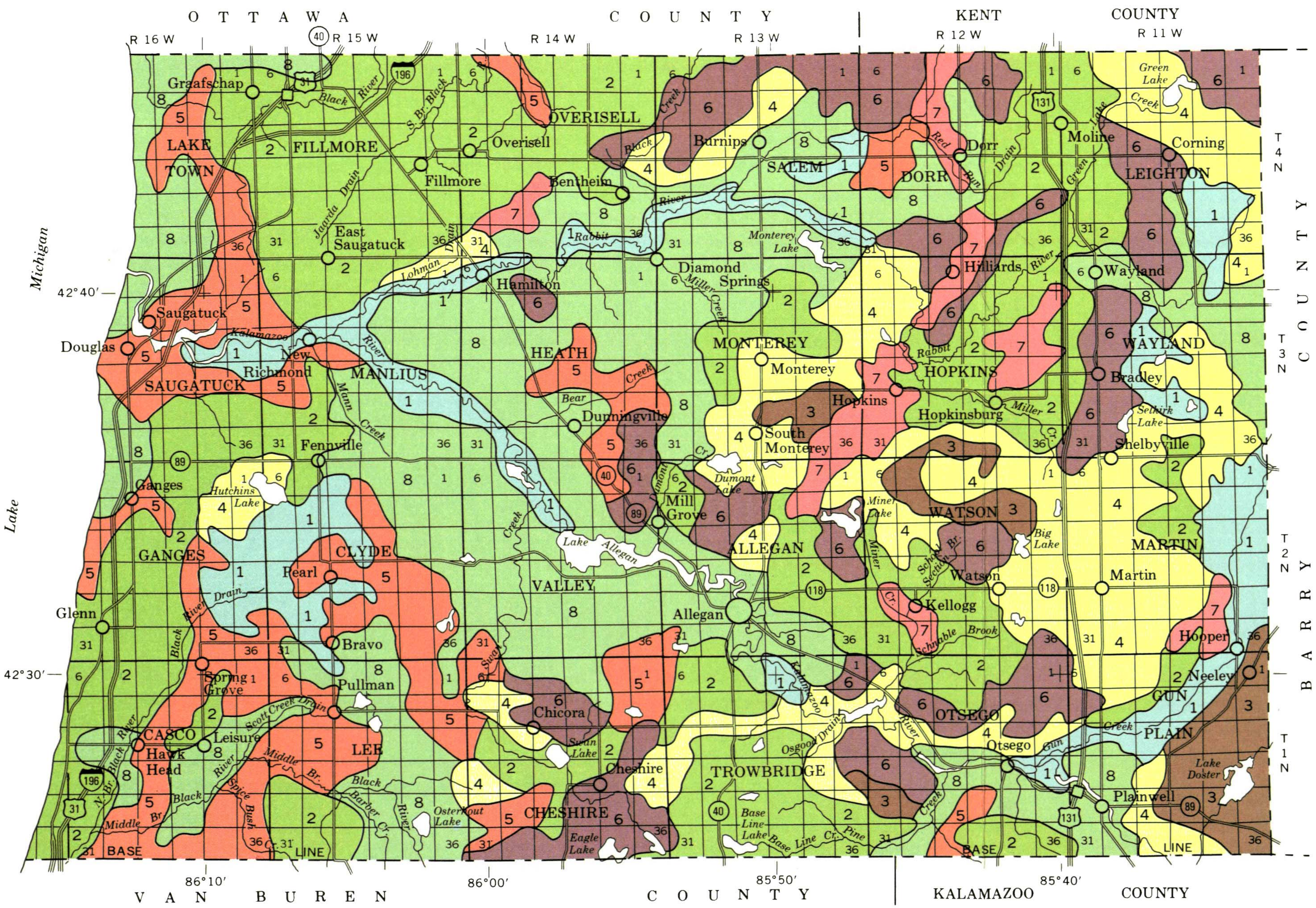
program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

Supplemental Nutrition Assistance Program

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (http://directives.sc.egov.usda.gov/33085.wba).

All Other Inquiries

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (http://directives.sc.egov.usda.gov/33086.wba).



LEGEND

1 — GLENDORA-ADRIAN-GRANBY association: Nearly level, poorly drained and very poorly drained soils formed in sandy and organic material; on flood plains, outwash plains, lake plains, and till plains

2 — CAPAC-RIMER-PIPESTONE association: Nearly level and undulating, somewhat poorly drained soils formed in loamy, sandy, and silty material; on moraines, till plains, lake plains, and outwash plains

3 — OSHTEMO-CHELSEA-OCKLEY association: Rolling to very hilly, well drained and somewhat excessively drained soils formed in loamy and sandy material; on moraines, outwash plains, terraces, and valley trains

4 — CHELSEA-OCKLEY-OSHTEMO association: Nearly level to gently rolling, somewhat excessively drained and well drained soils formed in sandy and loamy material; on moraines, outwash plains, terraces, and valley trains

5 — MOROCCO-NEWTON-OAKVILLE association: Nearly level and undulating, somewhat poorly drained, very poorly drained, well drained, and moderately well drained soils formed in sandy material; on outwash plains, lake plains, and beach ridges

6 — MARLETTE-CAPAC-METEA association: Nearly level to very hilly, moderately well drained, somewhat poorly drained, and well drained soils formed in loamy and sandy material; on moraines and till plains

7 — SEBEWA-COLWOOD-BRADY association: Nearly level, poorly drained and somewhat poorly drained soils formed in loamy, sandy, and silty material; on outwash plains, lake plains, valley trains, and terraces

8 — OAKVILLE association: Nearly level to steep, moderately well drained and well drained soils formed in sandy material; on outwash plains, lake plaines, dunes, moraines, and beach ridges

COMPILED 1984

N

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
MICHIGAN AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

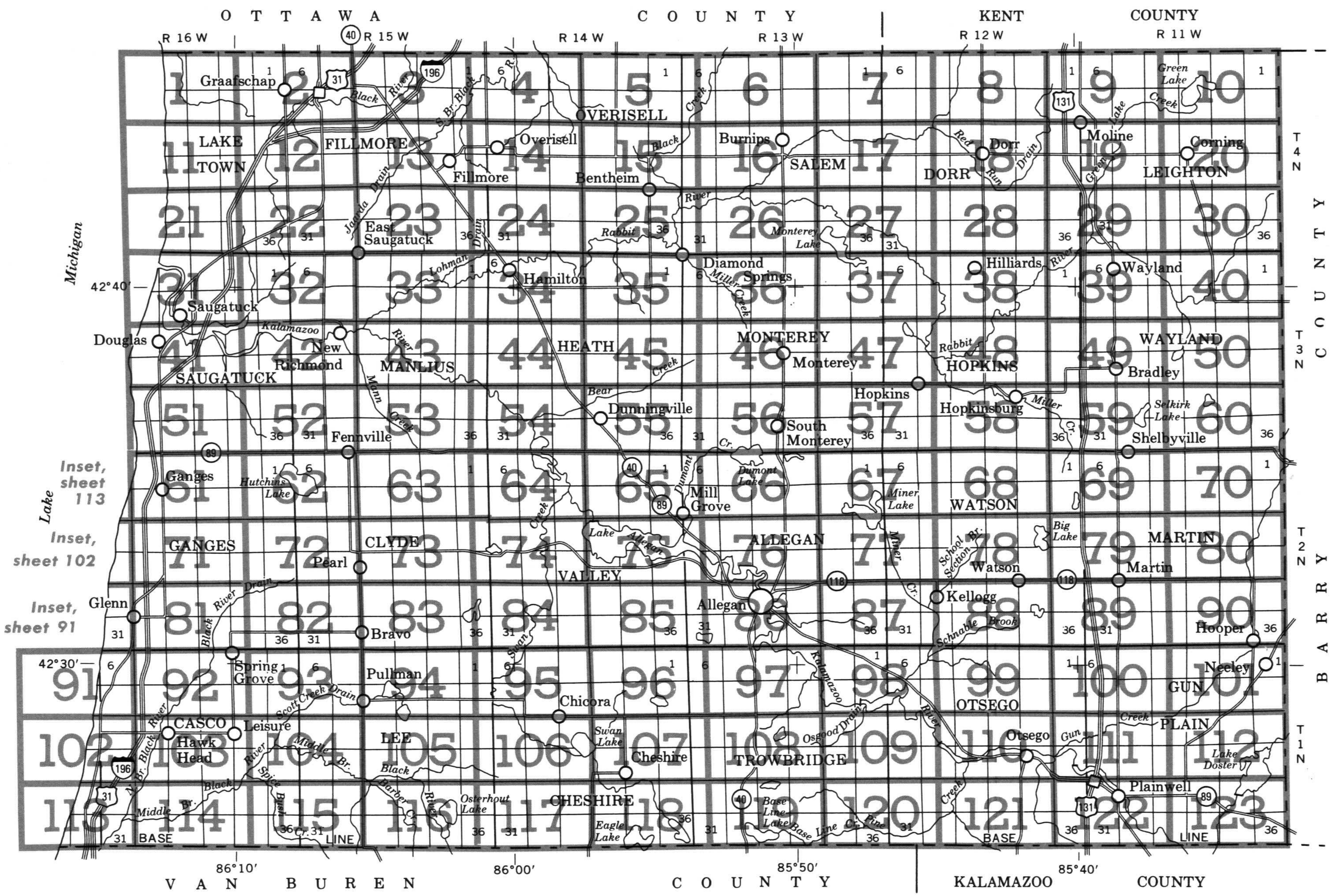
ALLEGAN COUNTY, MICHIGAN

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



INDEX TO MAP SHEETS

ALLEGAN COUNTY, MICHIGAN

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km

SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and a letter. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas.

SYMBOL	NAME
2	Glendora loamy sand
4	Dune land and Beaches
5	Houghton muck
6	Adrian muck
7	Palms muck
8B	Glynwood clay loam, 1 to 6 percent slopes
8C	Glynwood clay loam, 6 to 12 percent slopes
10B	Oakville fine sand, 0 to 6 percent slopes
10C	Oakville fine sand, 6 to 18 percent slopes
10E	Oakville fine sand, 18 to 45 percent slopes
11B	Oshtemo-Chelsea complex, 0 to 6 percent slopes
11C	Oshtemo-Chelsea complex, 6 to 12 percent slopes
11D	Oshtemo-Chelsea complex, 12 to 18 percent slopes
11E	Oshtemo-Chelsea complex, 18 to 35 percent slopes
12B	Ockley loam, 1 to 6 percent slopes
12C	Ockley loam, 6 to 12 percent slopes
12D	Ockley loam, 12 to 18 percent slopes
12E	Ockley loam, 18 to 30 percent slopes
14C	Marlette loam, 6 to 12 percent slopes
14D	Marlette loam, 12 to 18 percent slopes
14E	Marlette loam, 18 to 35 percent slopes
15B	Morocco-Newton complex, 0 to 3 percent slopes
16B	Capac loam, 0 to 6 percent slopes
17	Brookston loam
18	Pits
19A	Brady sandy loam, 0 to 3 percent slopes
21B	Capac-Wixom complex, 1 to 4 percent slopes
22A	Matherton loam, 0 to 3 percent slopes
23	Sebewa loam
26A	Pipestone sand, 0 to 4 percent slopes
27B	Metea loamy fine sand, 1 to 6 percent slopes
27C	Metea loamy fine sand, 6 to 12 percent slopes
28A	Rimer loamy sand, 0 to 4 percent slopes
29	Cohoctah silt loam
30	Colwood silt loam
31B	Tekenink loamy fine sand, 2 to 6 percent slopes
31C	Tekenink loamy fine sand, 6 to 12 percent slopes
31D	Tekenink loamy fine sand, 12 to 18 percent slopes
31E	Tekenink loamy fine sand, 18 to 35 percent slopes
33A	Kibbie fine sandy loam, 0 to 3 percent slopes
34	Aquents, sandy and loamy
36	Corunna sandy loam
39	Granby loamy sand
41B	Blount silt loam, 1 to 4 percent slopes
42B	Metamora sandy loam, 1 to 4 percent slopes
44B	Chelsea loamy fine sand, 0 to 6 percent slopes
44C	Chelsea loamy fine sand, 6 to 12 percent slopes
44D	Chelsea loamy fine sand, 12 to 18 percent slopes
44E	Chelsea loamy fine sand, 18 to 30 percent slopes
45	Pewamo silt loam
47	Napoleon muck
48	Belleville loamy sand
49A	Tedrow fine sand, 0 to 4 percent slopes
50	Aquents and Histosols, ponded
51A	Thetford loamy fine sand, 0 to 4 percent slopes
53B	Oakville fine sand, loamy substratum, 0 to 6 percent slopes
57A	Covert sand, 0 to 4 percent slopes
60B	Seward loamy fine sand, 1 to 6 percent slopes
62	Sloan silt loam
63B	Riddles loam, 1 to 6 percent slopes
63C	Riddles loam, 6 to 12 percent slopes
64	Belleville-Brookston complex
65	Cohoctah silt loam, protected
66	Udipsamments, nearly level to gently sloping
67	Martisco muck
69	Newton mucky fine sand
70A	Morocco fine sand, 0 to 3 percent slopes
72B	Urban land-Oakville complex, 0 to 6 percent slopes
73A	Algansee loamy sand, protected, 0 to 3 percent slopes
74	Glendora loamy sand, protected
75B	Marlette-Capac loams, 1 to 6 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label) — Hedley Airstrip

- Small airport, airfield, park, oilfield, cemetery, or flood pool — FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate — 21
- Federal — 173
- State — 28
- County, farm or ranch — 1283

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small — water, w

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — Gas
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water, w
- Intermittent — int, i

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — 17, 42B

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown) — S

MISCELLANEOUS

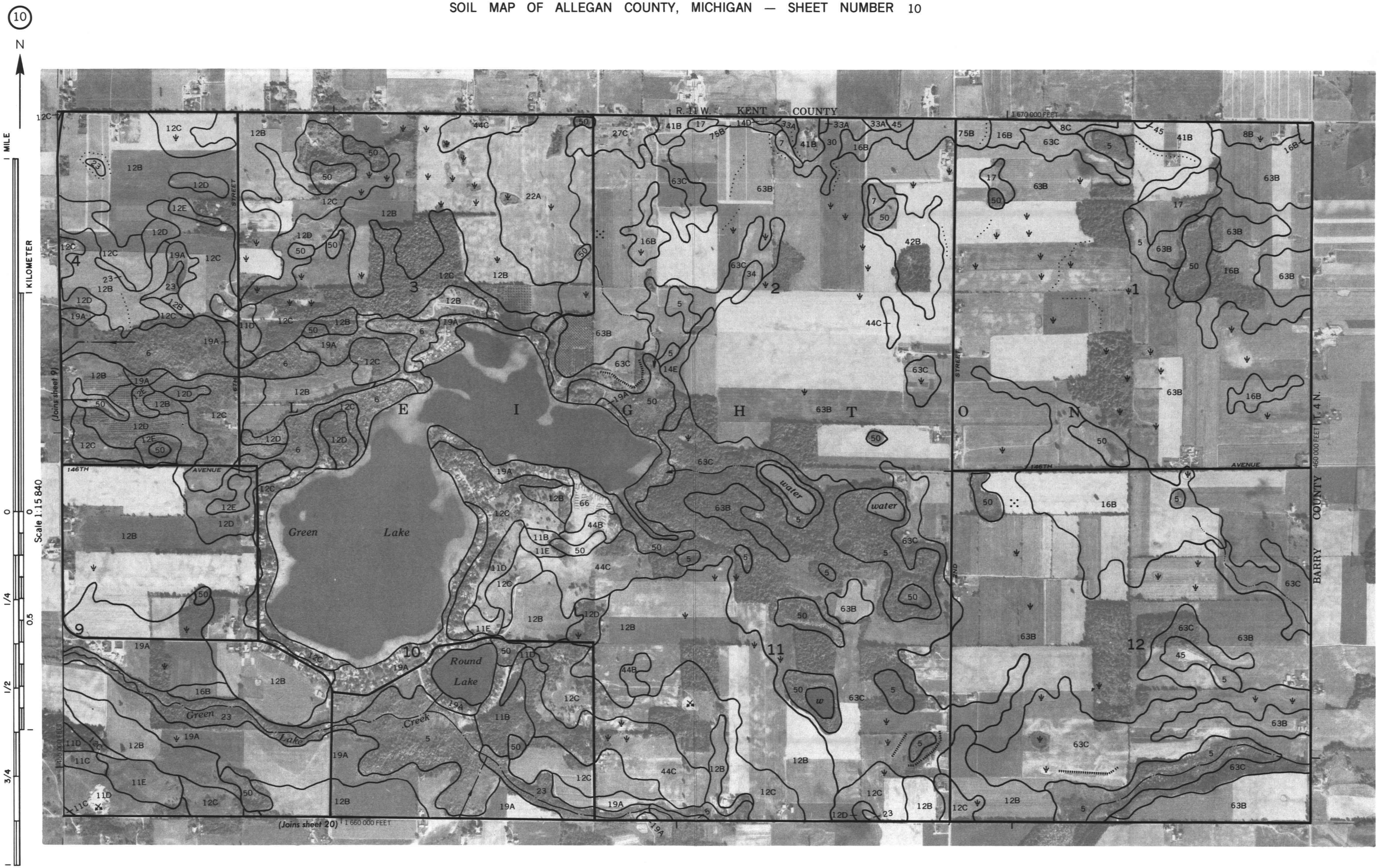
- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot
- Udipsamments and aquents (3 acres)
- Areas of severely wind eroded soils (1 to 10 acres)
- Sanitary land fills (Up to 10 acres)

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 1

1

ALLEGAN COUNTY, MICHIGAN NO. 1

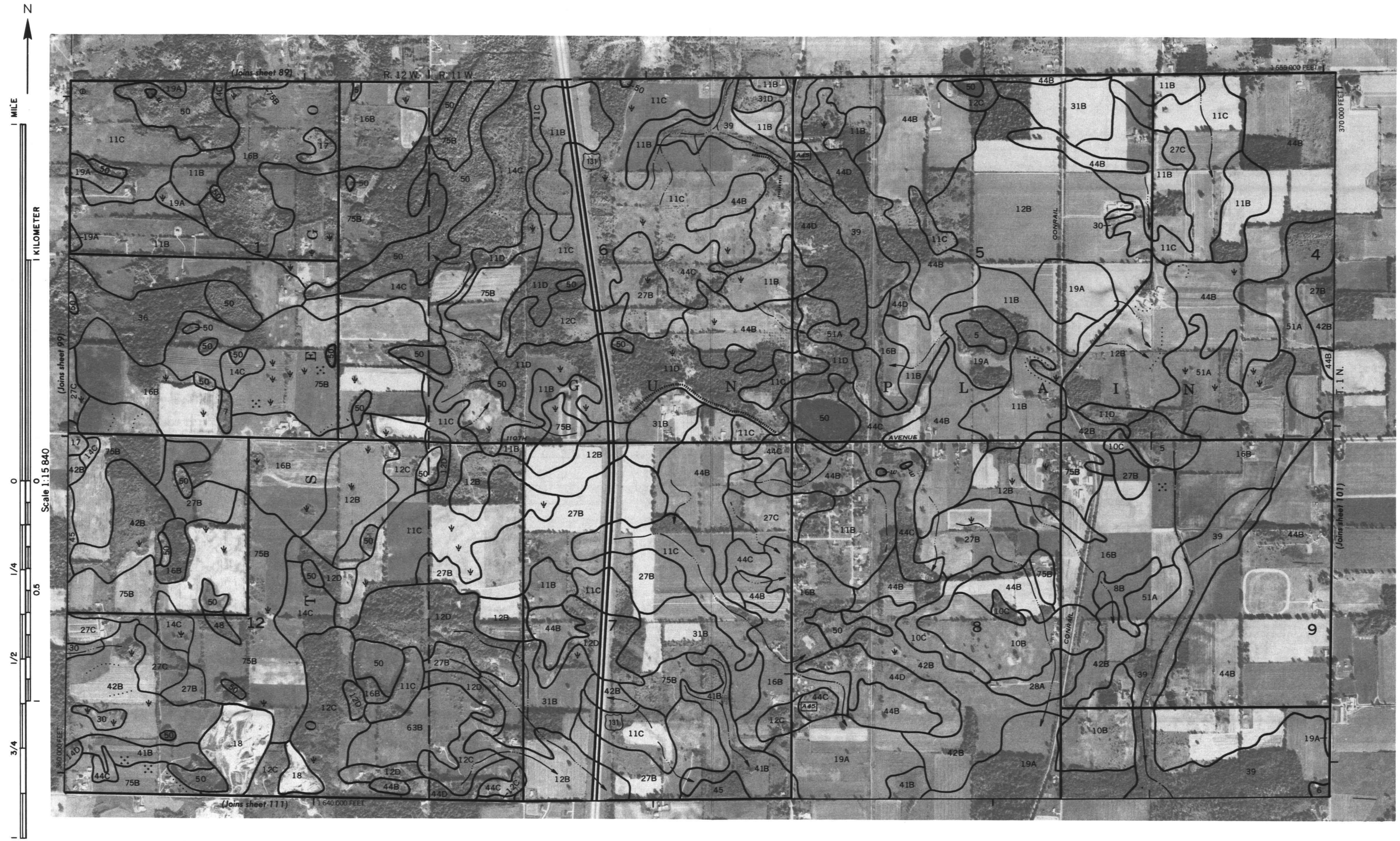
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

100

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 100

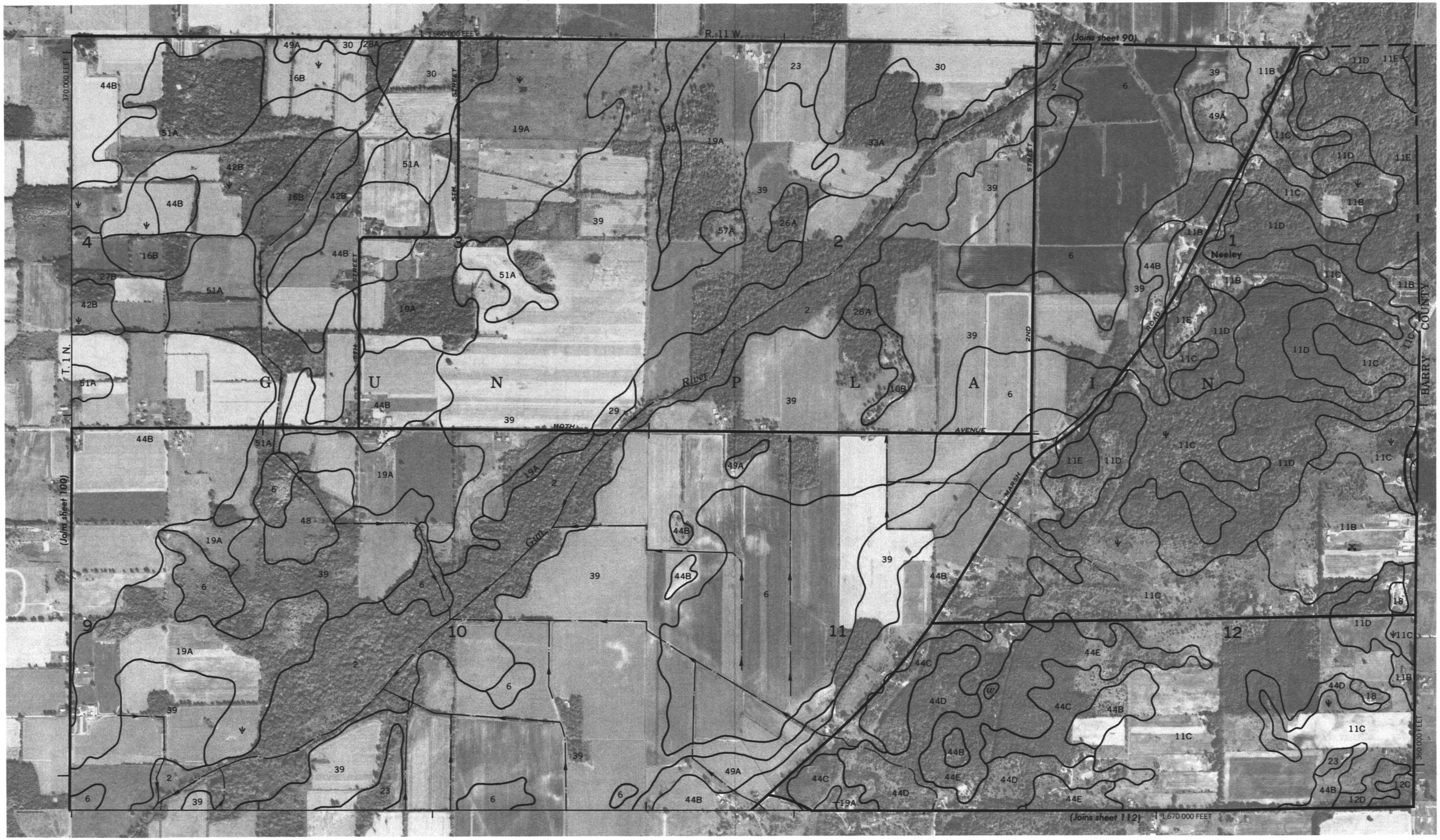


This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 100

101

N



1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 1

0 0.5 1

ALLEGAN COUNTY, MICHIGAN NO. 101

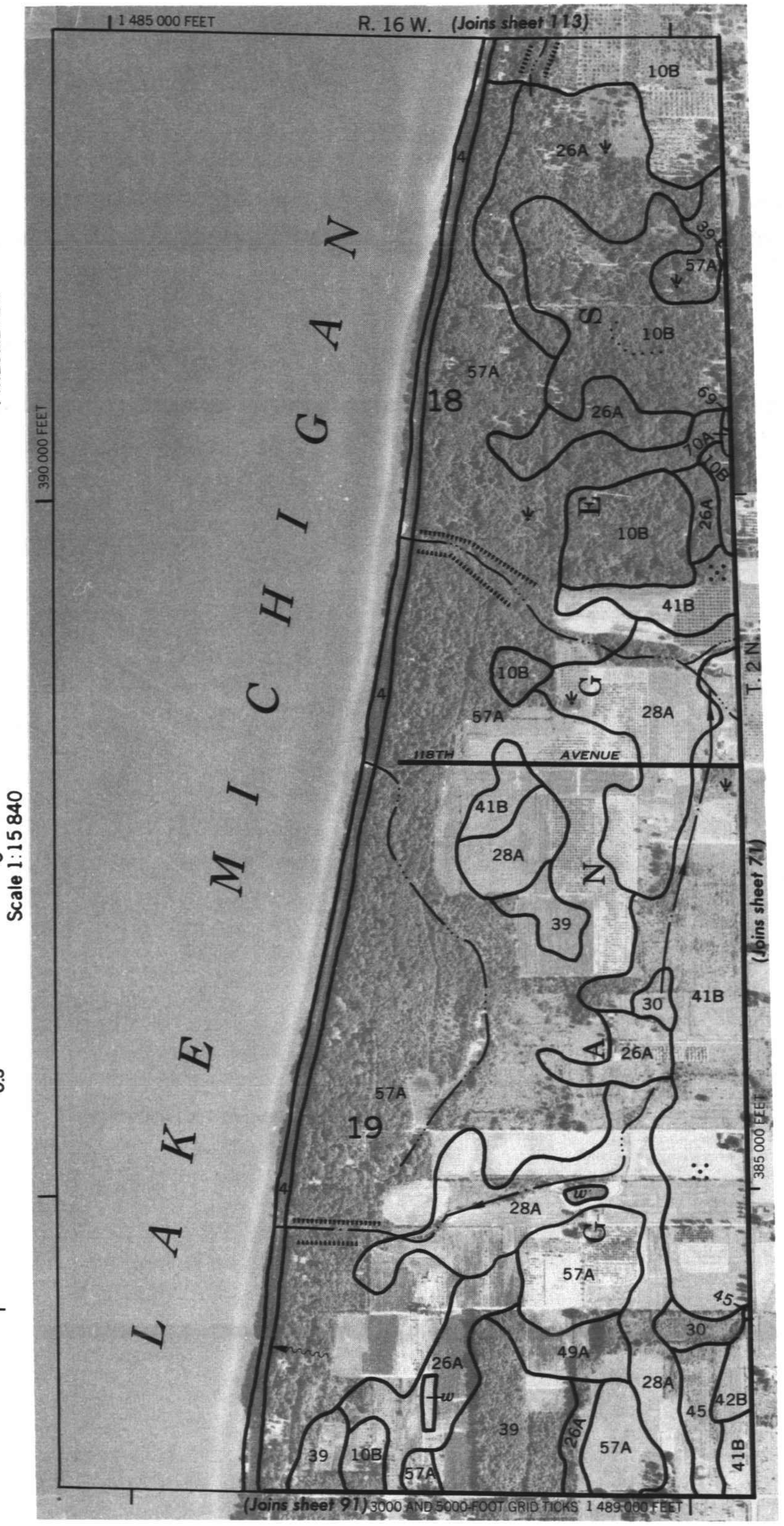
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

102

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 102

N

1 MILE
1 KILOMETER
0
0
Scale 1:15 840
1/4
0.5
1/2
1
3/4

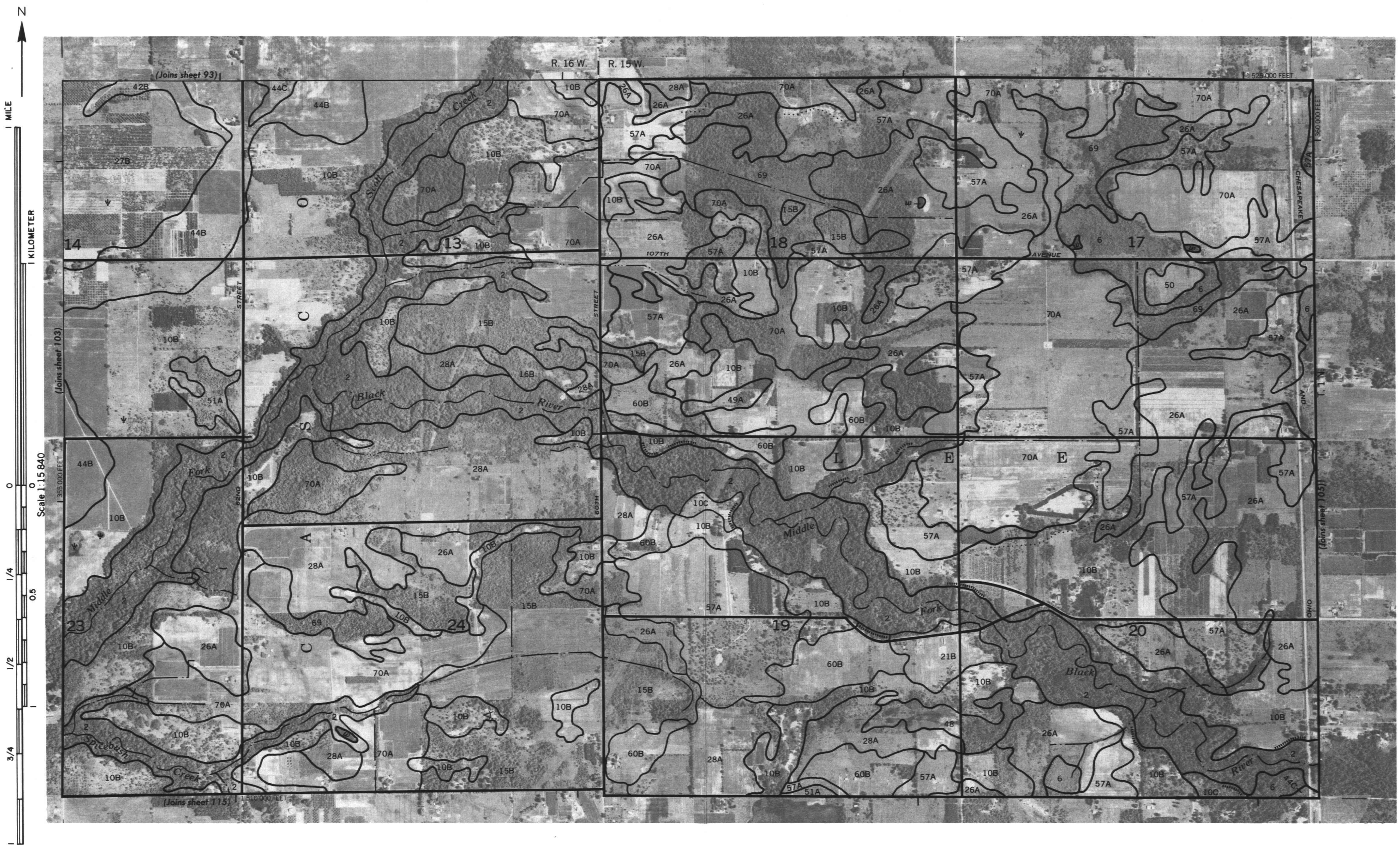


This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 102

ALLEGAN COUNTY, MICHIGAN NO. 103

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



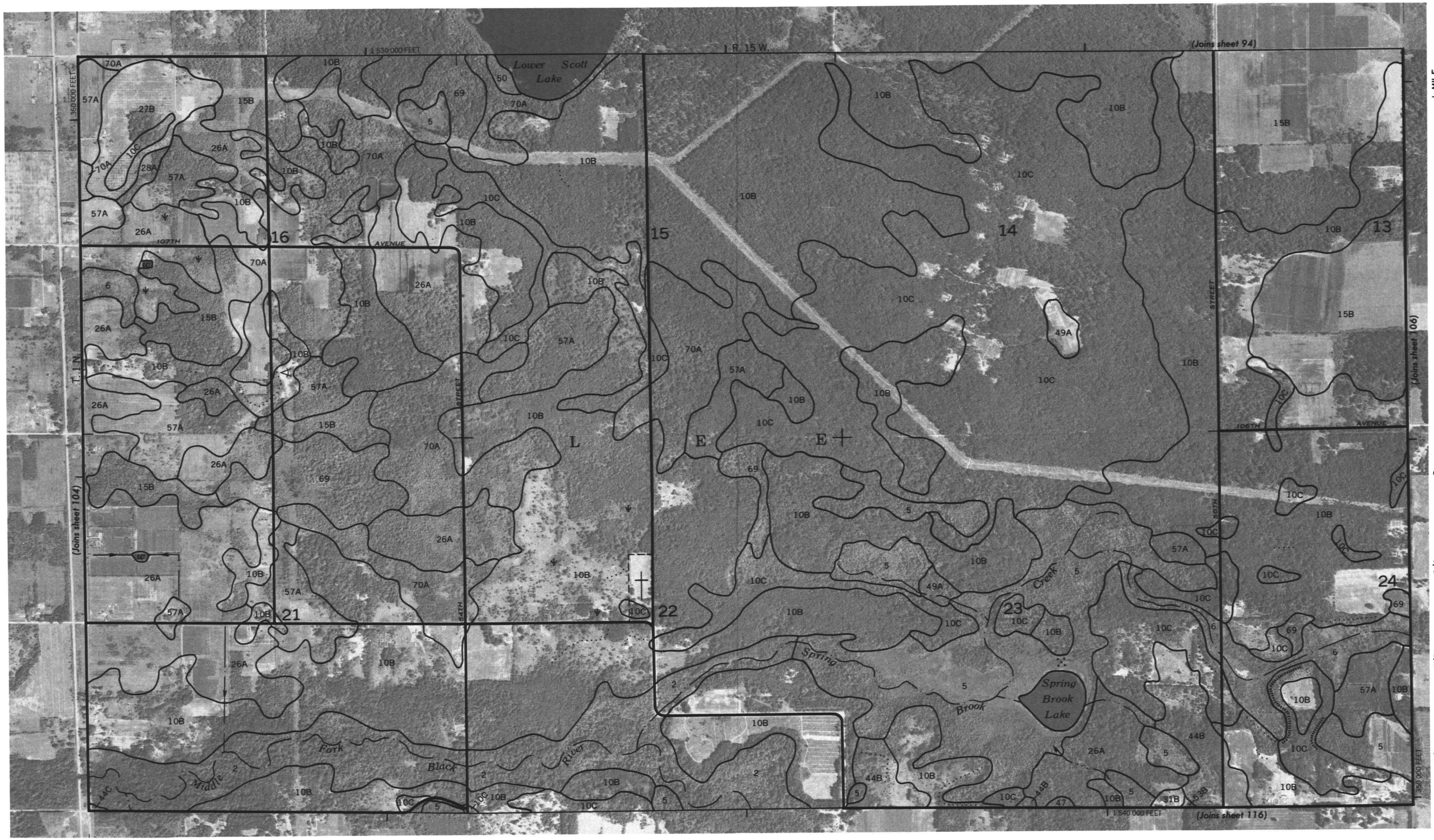
This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 104

(105)

ALLEGAN COUNTY, MICHIGAN NO. 105

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



N

Scale 1:15 840

0 1/4 1/2 3/4 1 MILE

0 0.5 1 KILOMETER

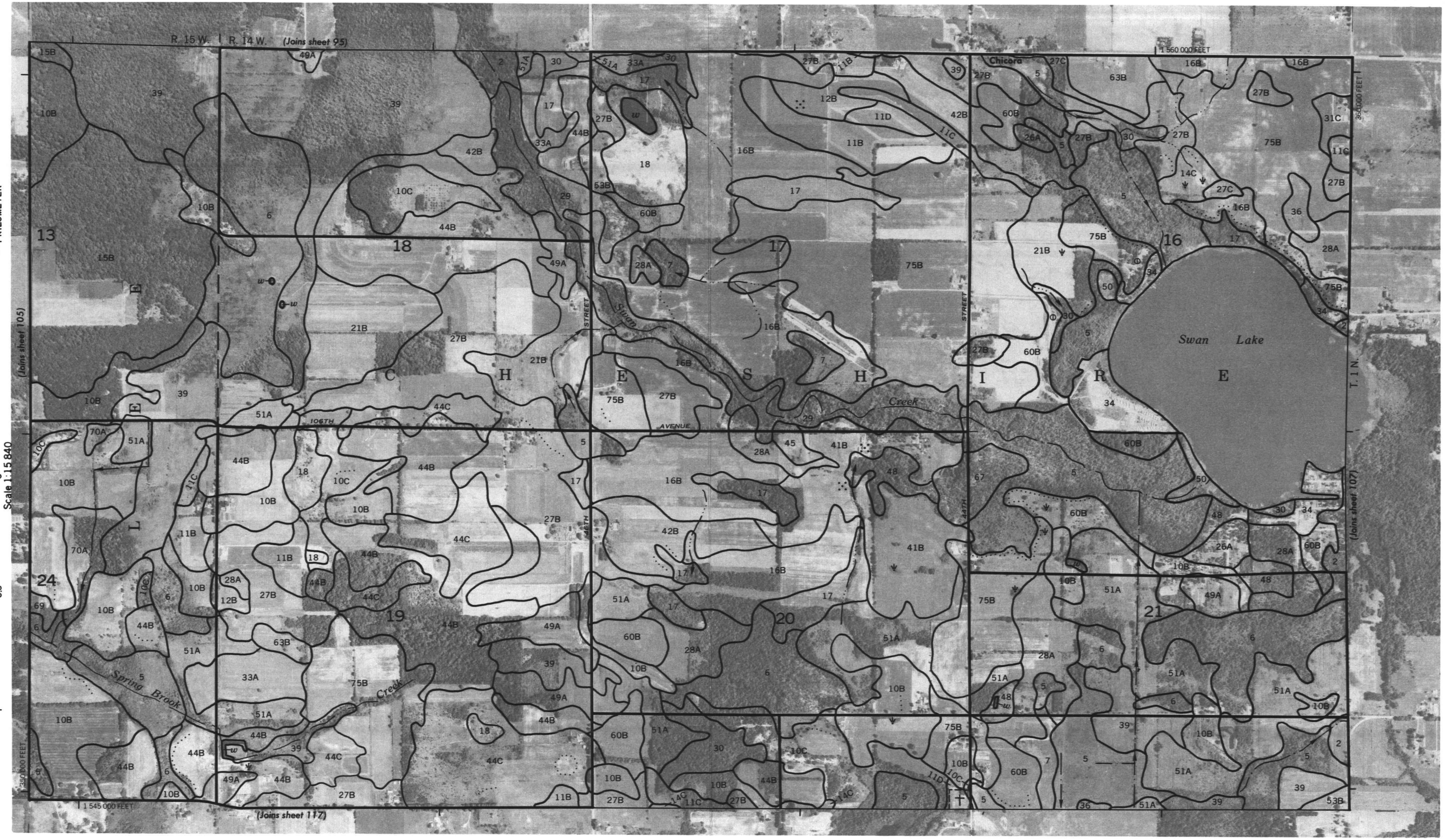
SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 106

N

1 MILE

1 KILOMETER

Scale 1:15 840

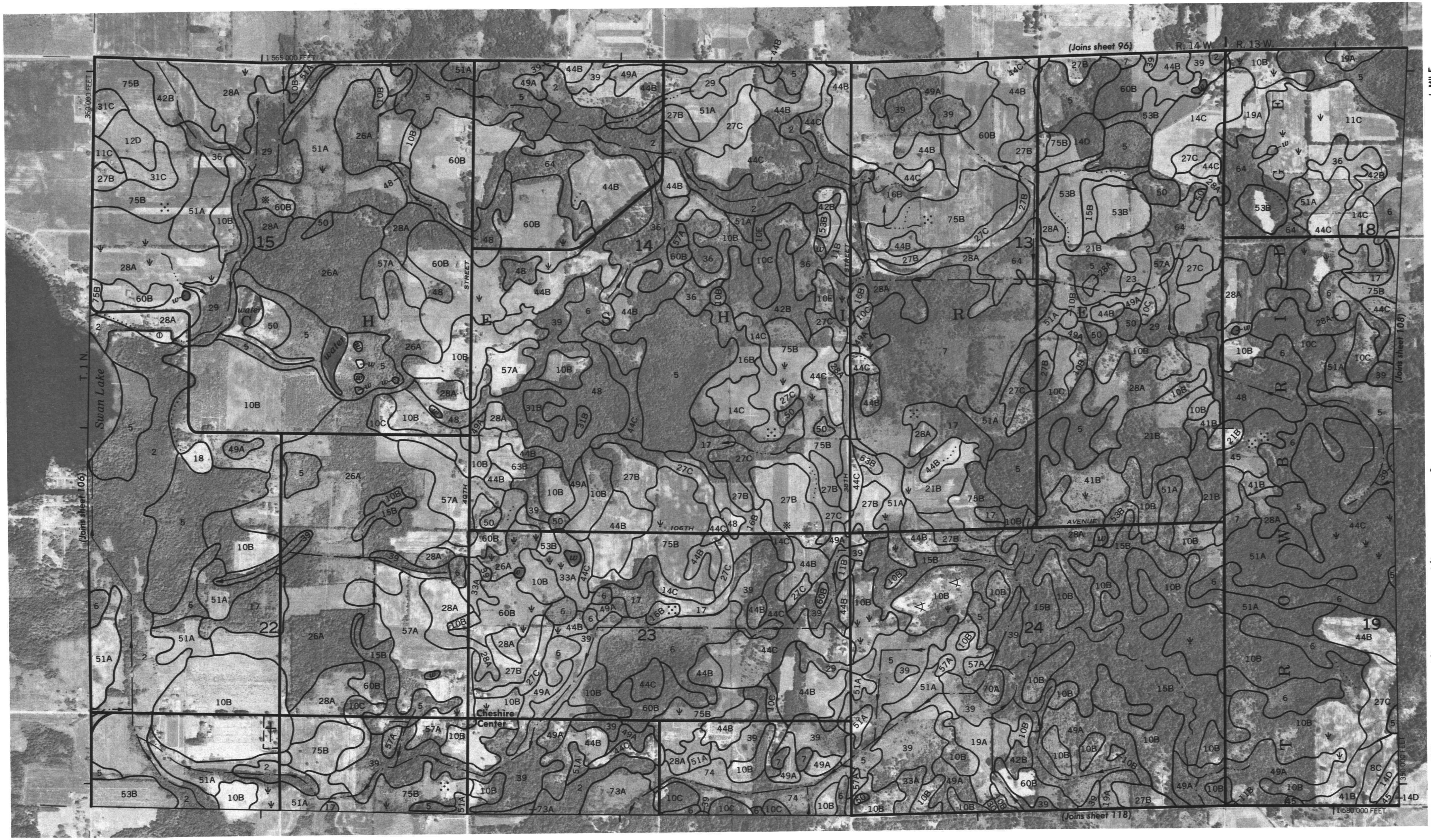


This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 106

ALLEGAN COUNTY, MICHIGAN NO. 107

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



N

1 MILE

1 KILOMETER

Scale 1:15 840

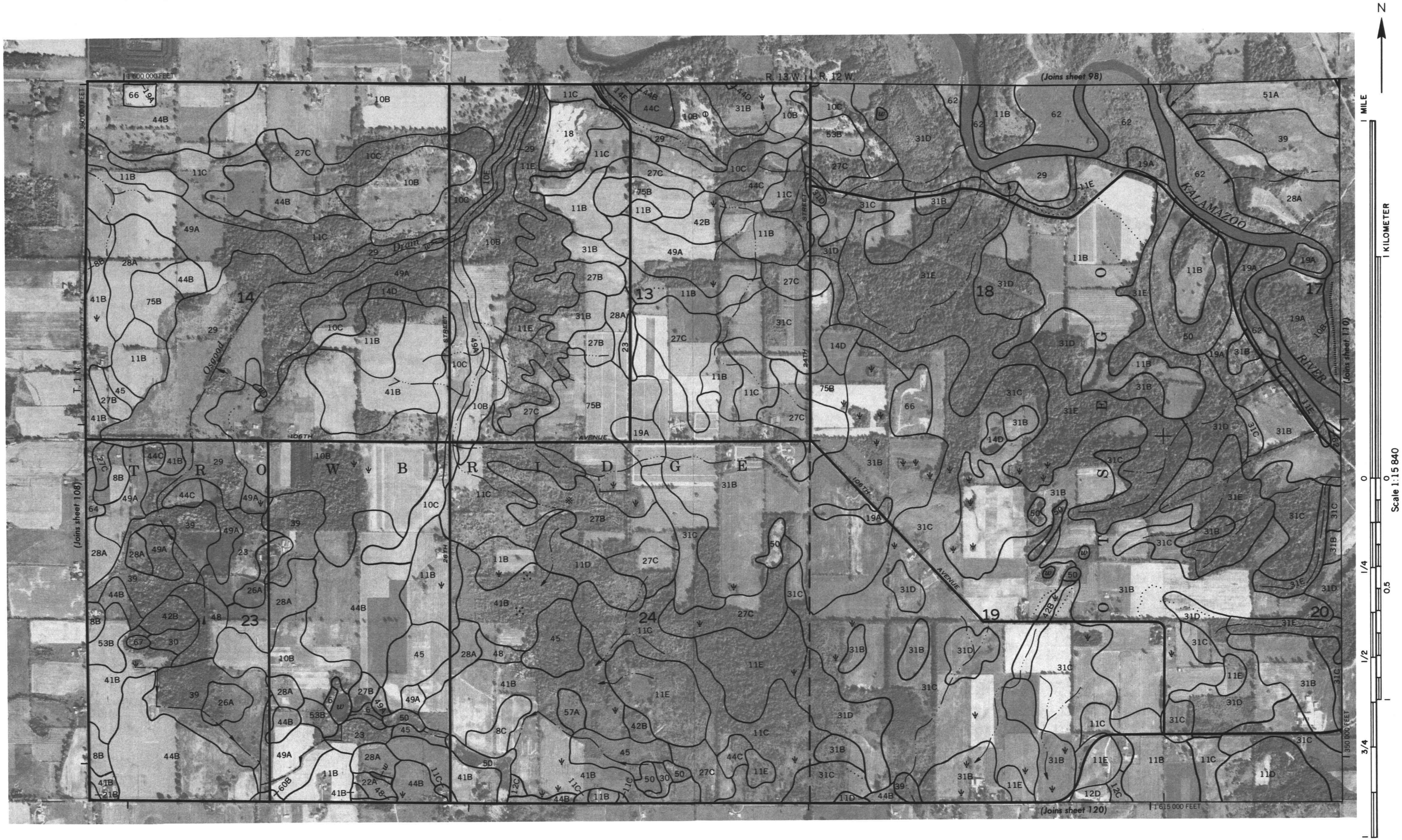
0 1/4 1/2 3/4 1

0 0.5 1

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 108

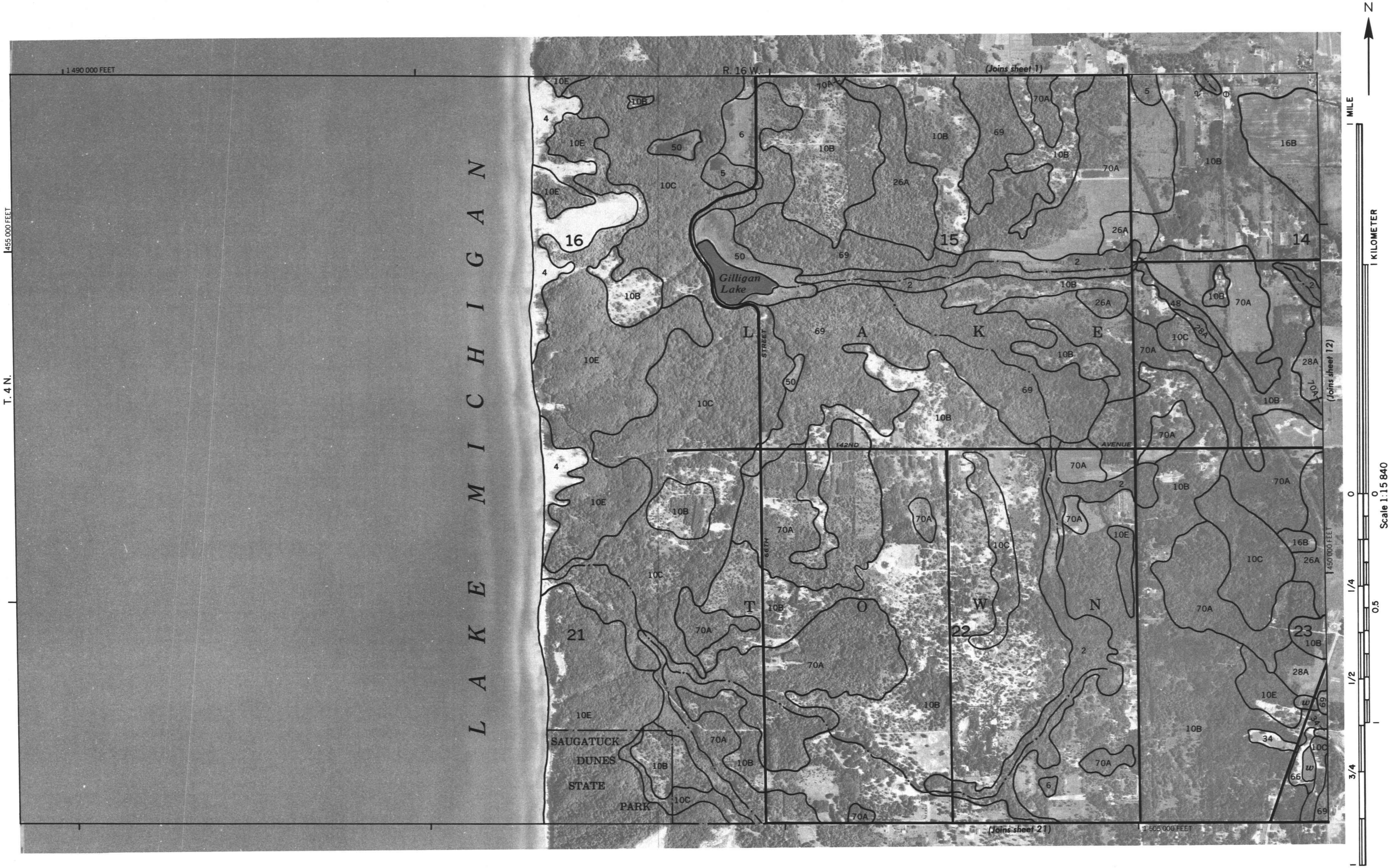
This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 108



ALLEGAN COUNTY, MICHIGAN NO. 109

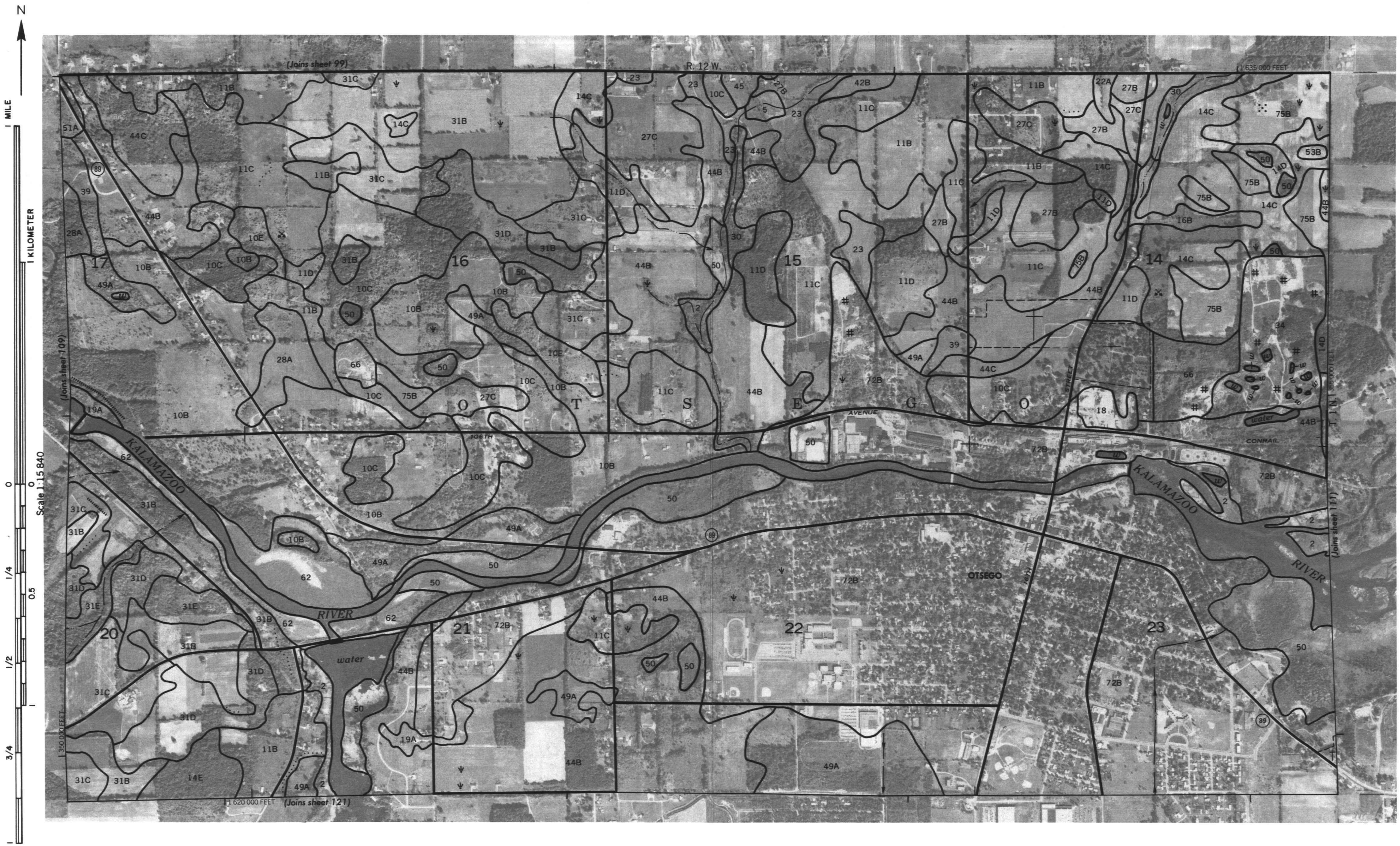
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



ALLEGAN COUNTY, MICHIGAN NO. 11

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 110



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

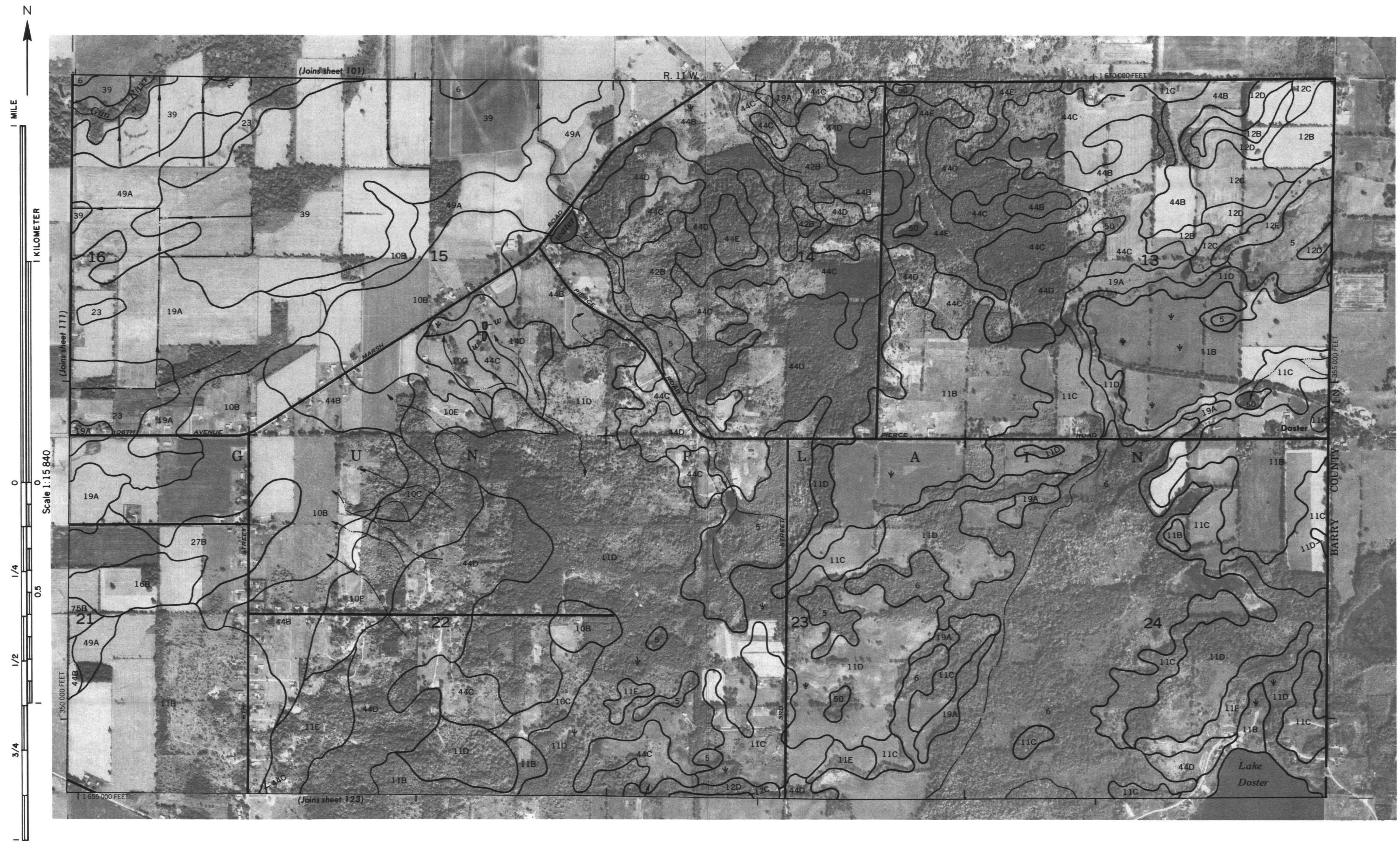
ALLEGAN COUNTY, MICHIGAN NO. 110

111

ALLEGAN COUNTY, MICHIGAN NO. 111

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 112

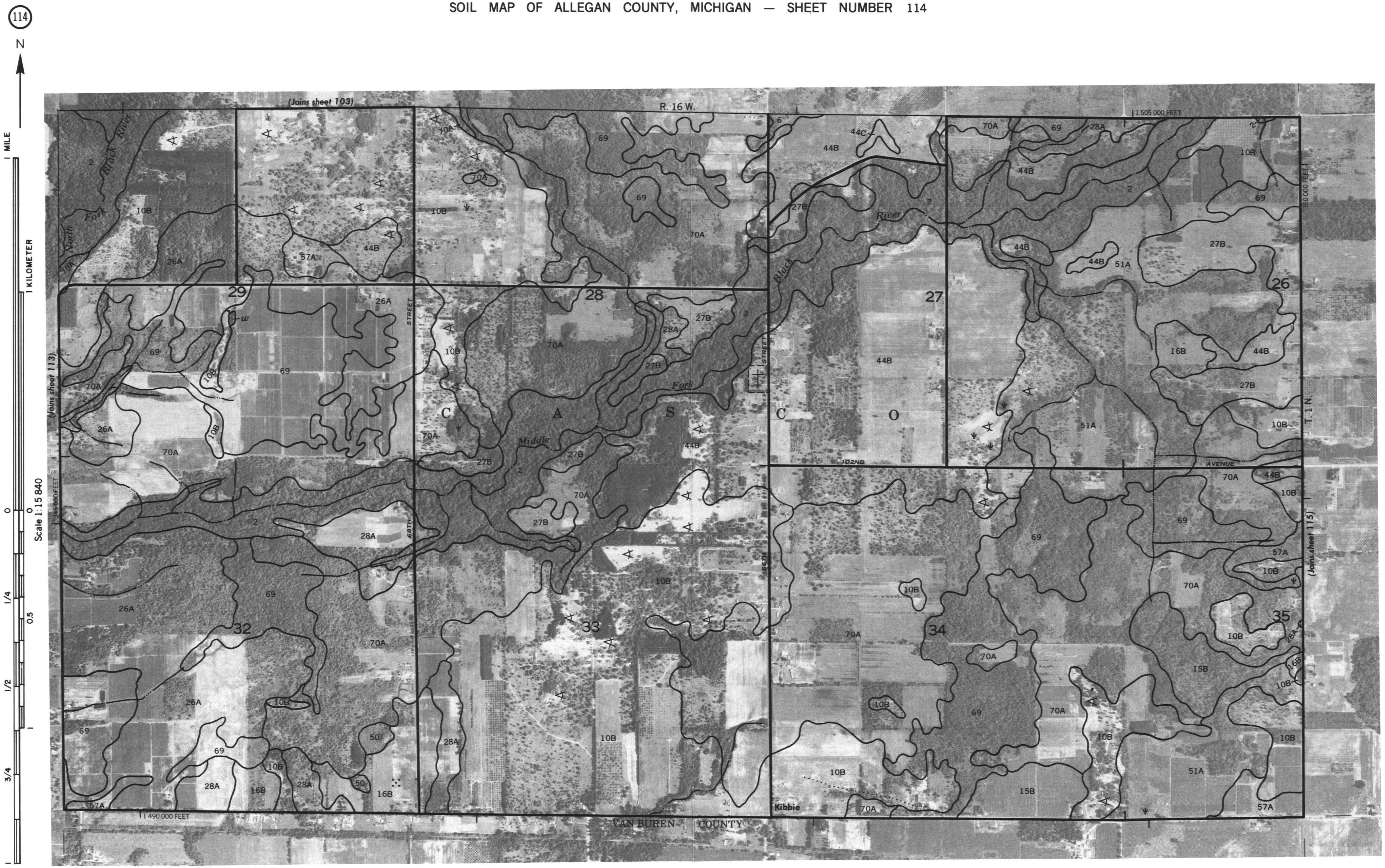


This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 113

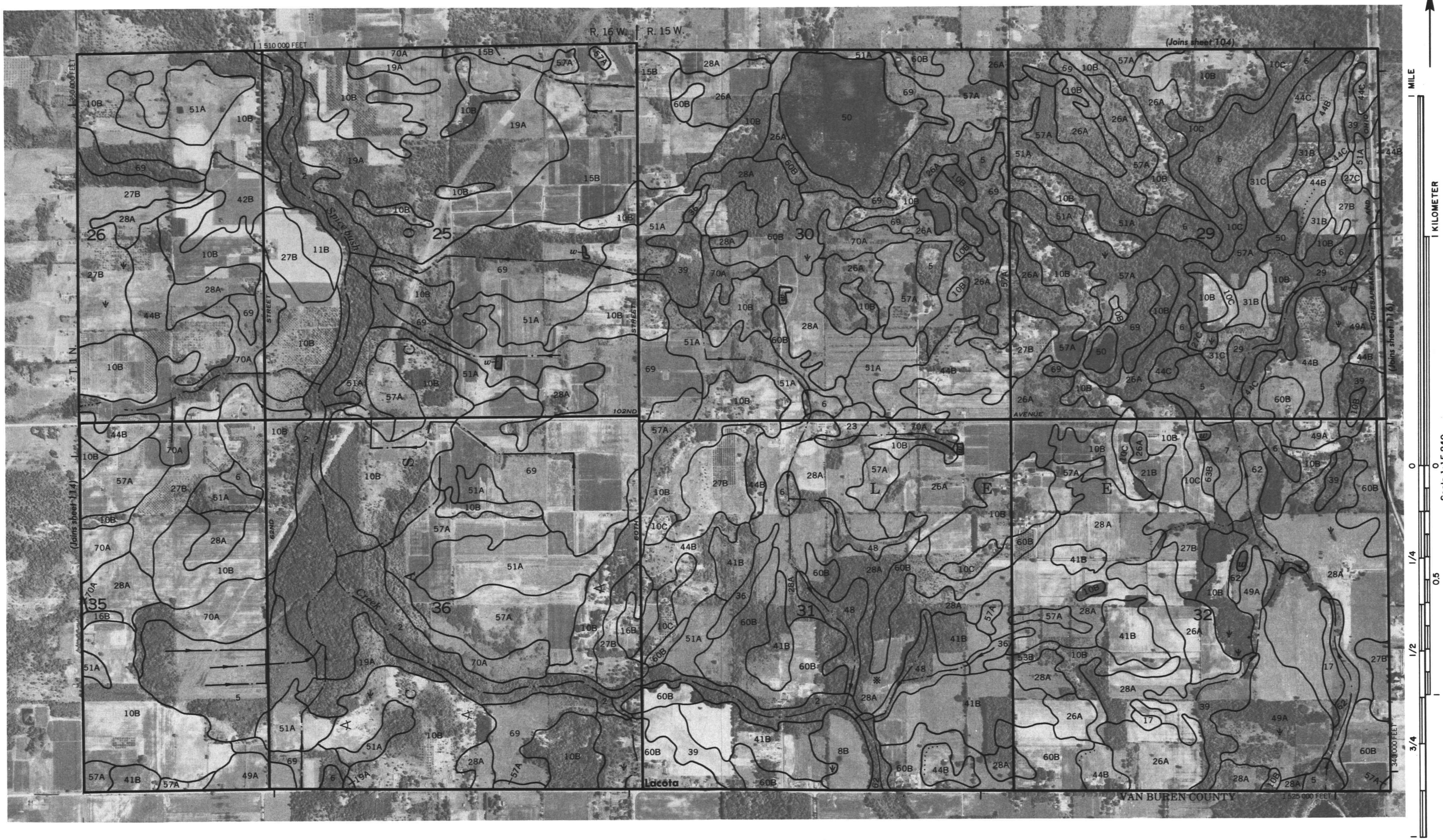
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 114



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 114



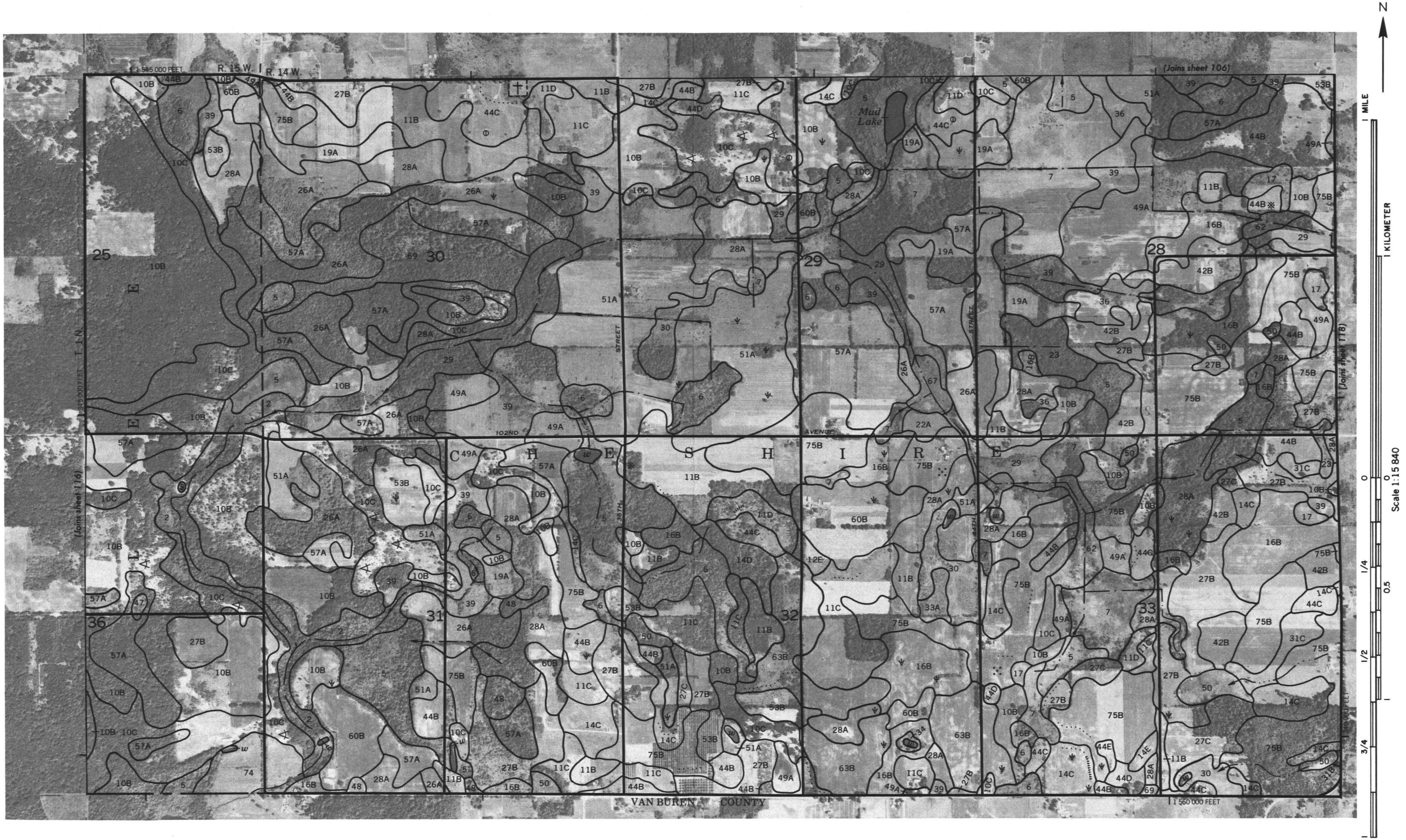
ALLEGAN COUNTY, MICHIGAN NO. 115

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 116

This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

117



ALLEGAN COUNTY, MICHIGAN NO. 117

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 118

N

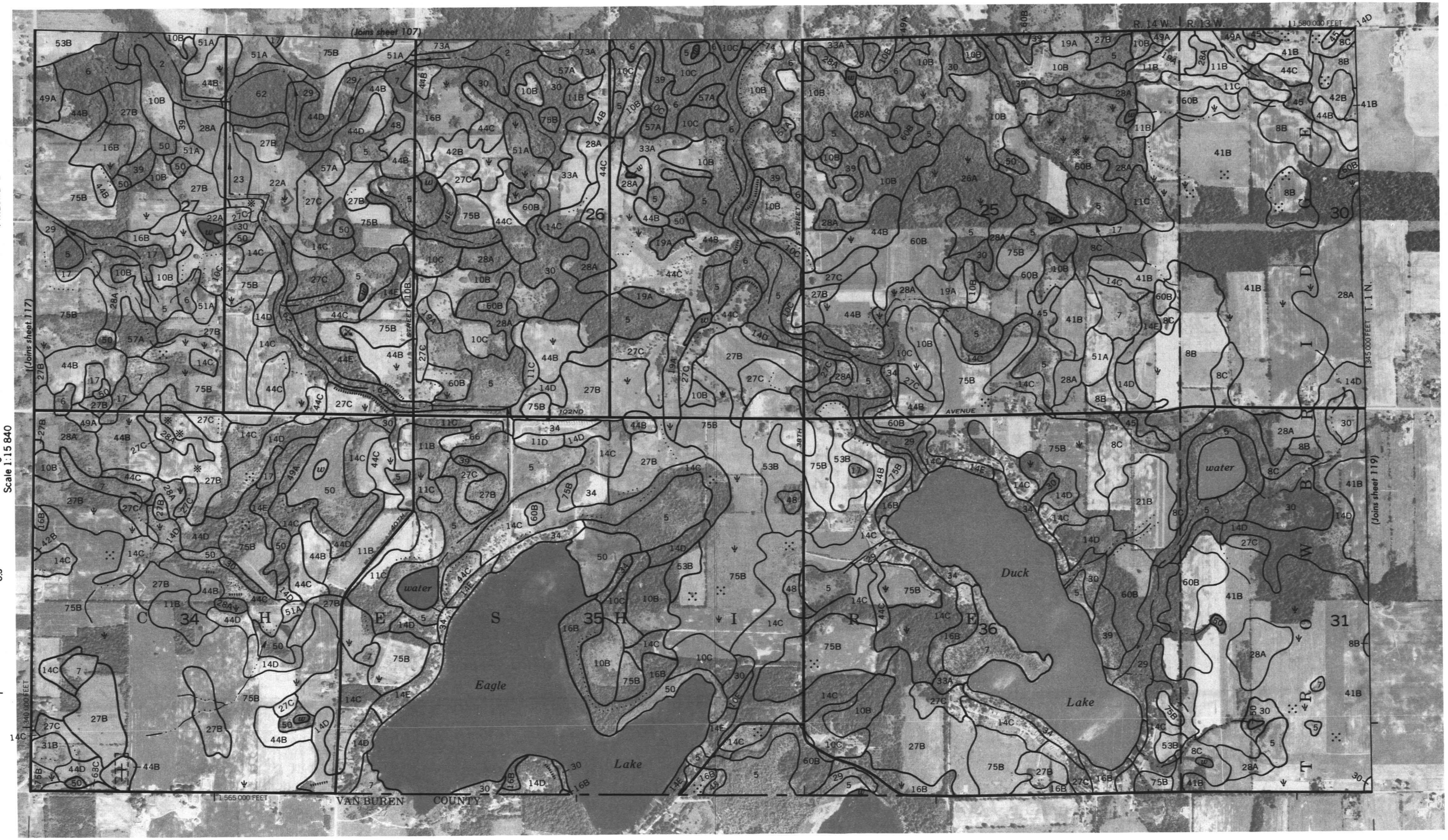
1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 1

0 0.5 1



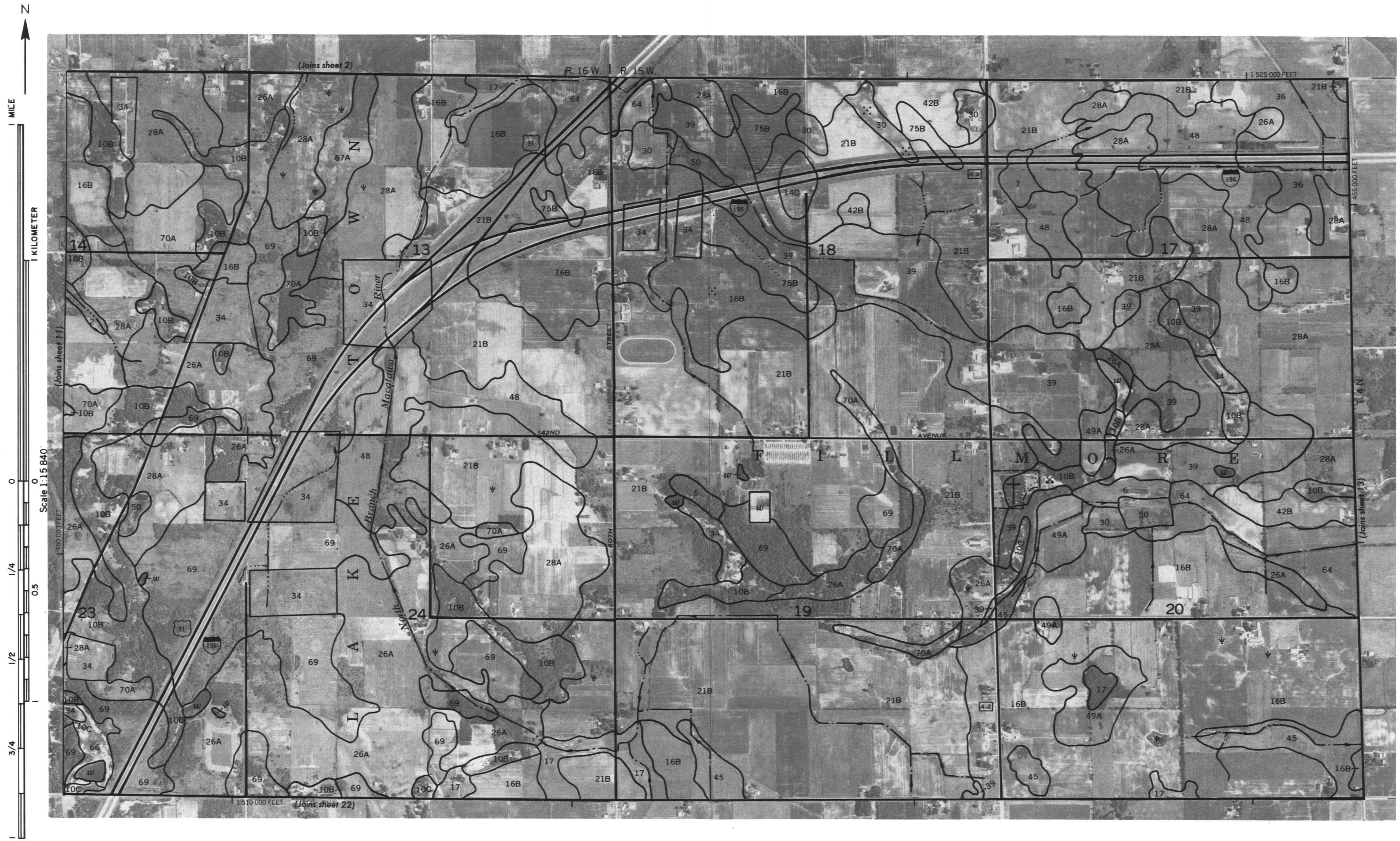
This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 118

ALLEGAN COUNTY, MICHIGAN NO. 119

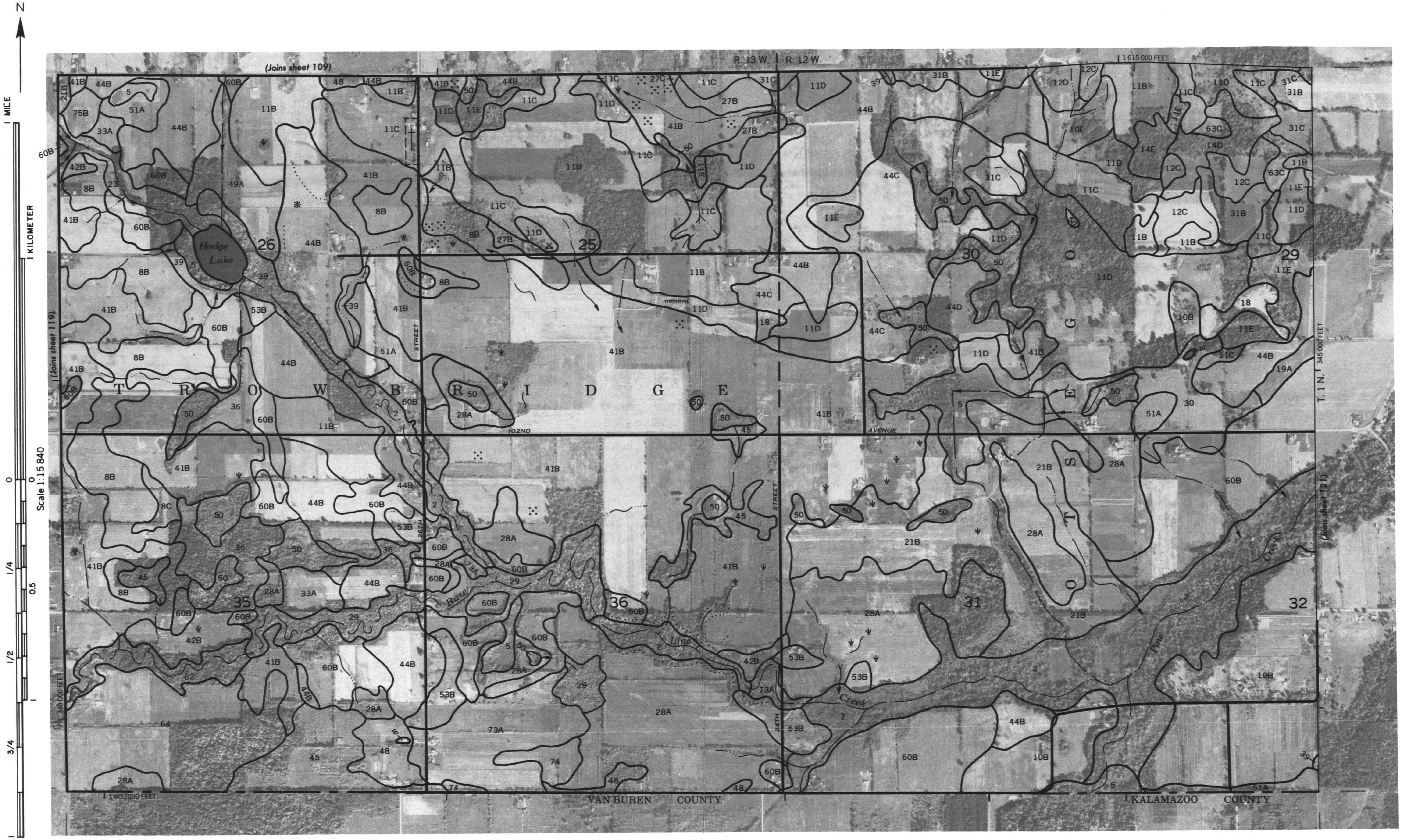
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 12



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

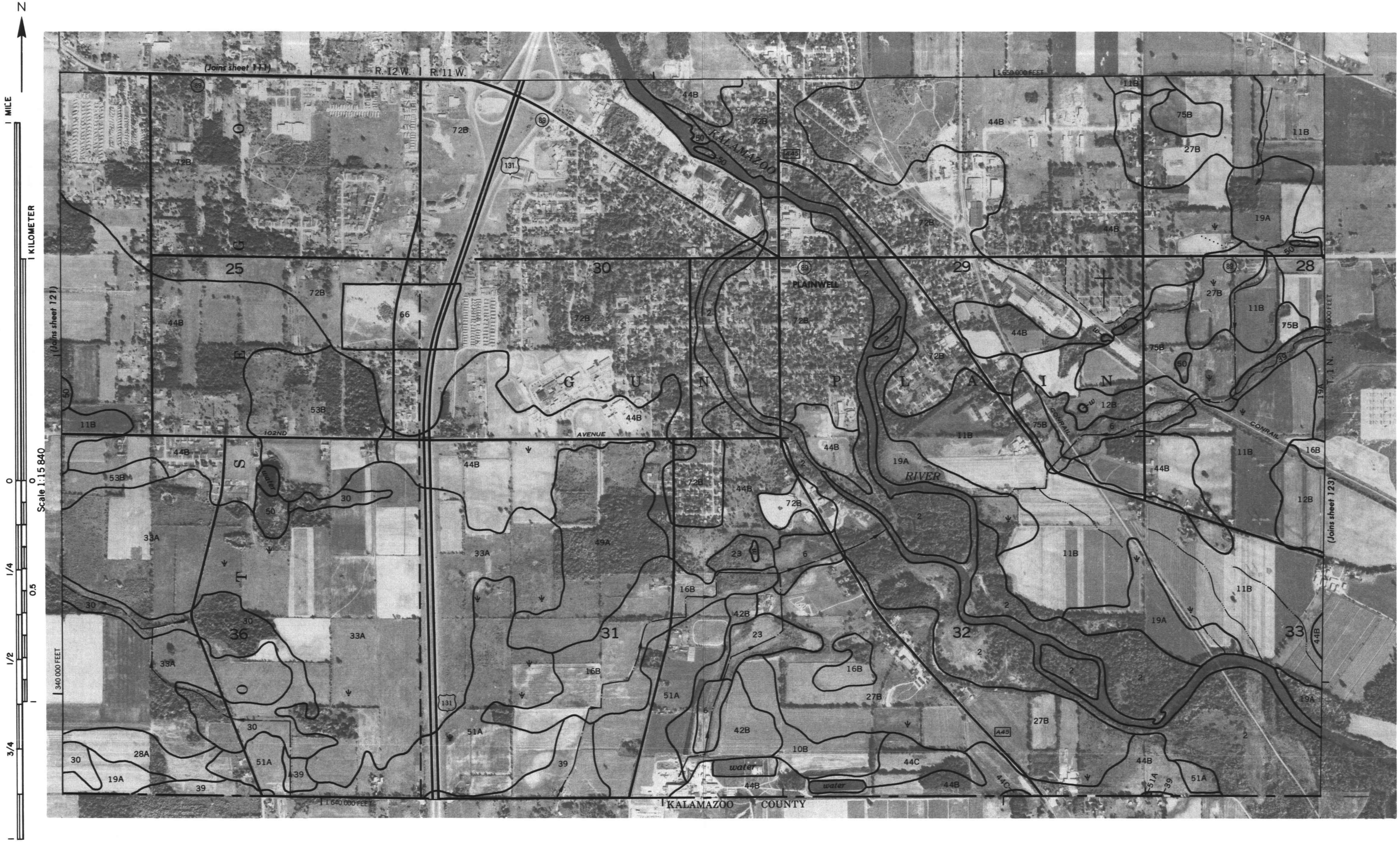
SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 120



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 121

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 123

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

13

N

1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 1

0 0.5 1

ALLEGAN COUNTY, MICHIGAN NO. 13

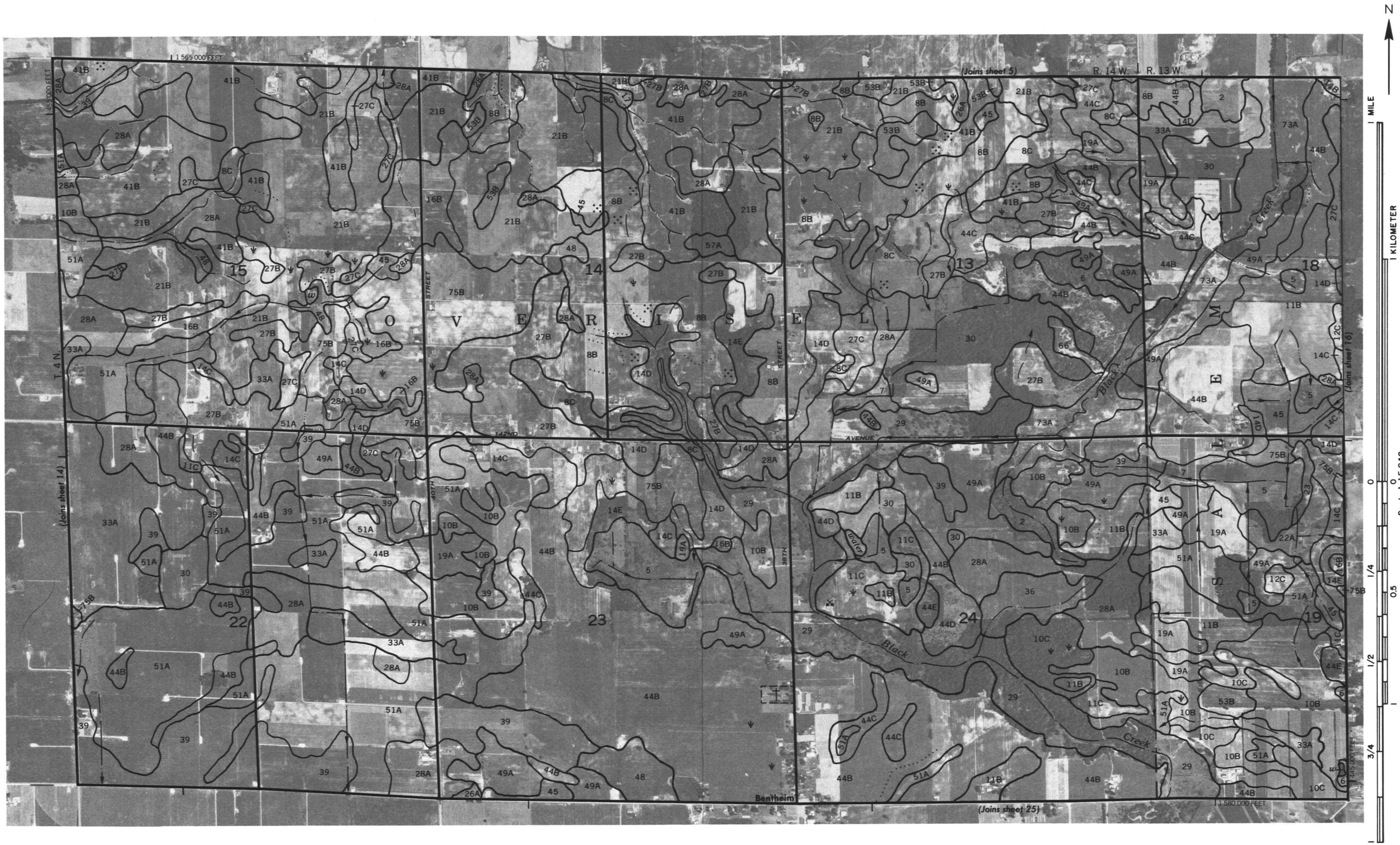
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

14

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 14

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 14



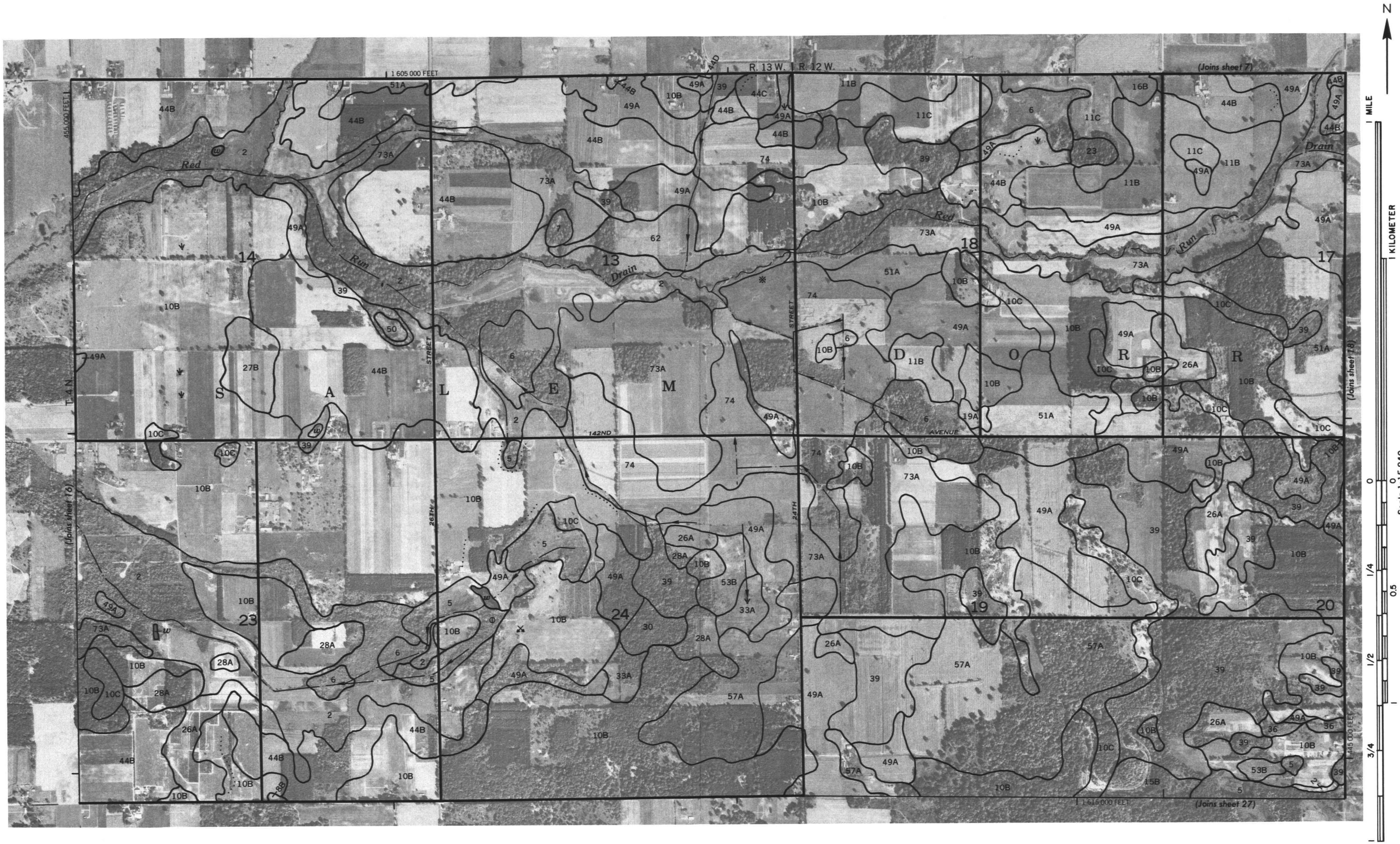
ALLEGAN COUNTY, MICHIGAN NO. 15

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 16

This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 16



ALLEGAN COUNTY, MICHIGAN NO. 17

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

18

N

1 MILE

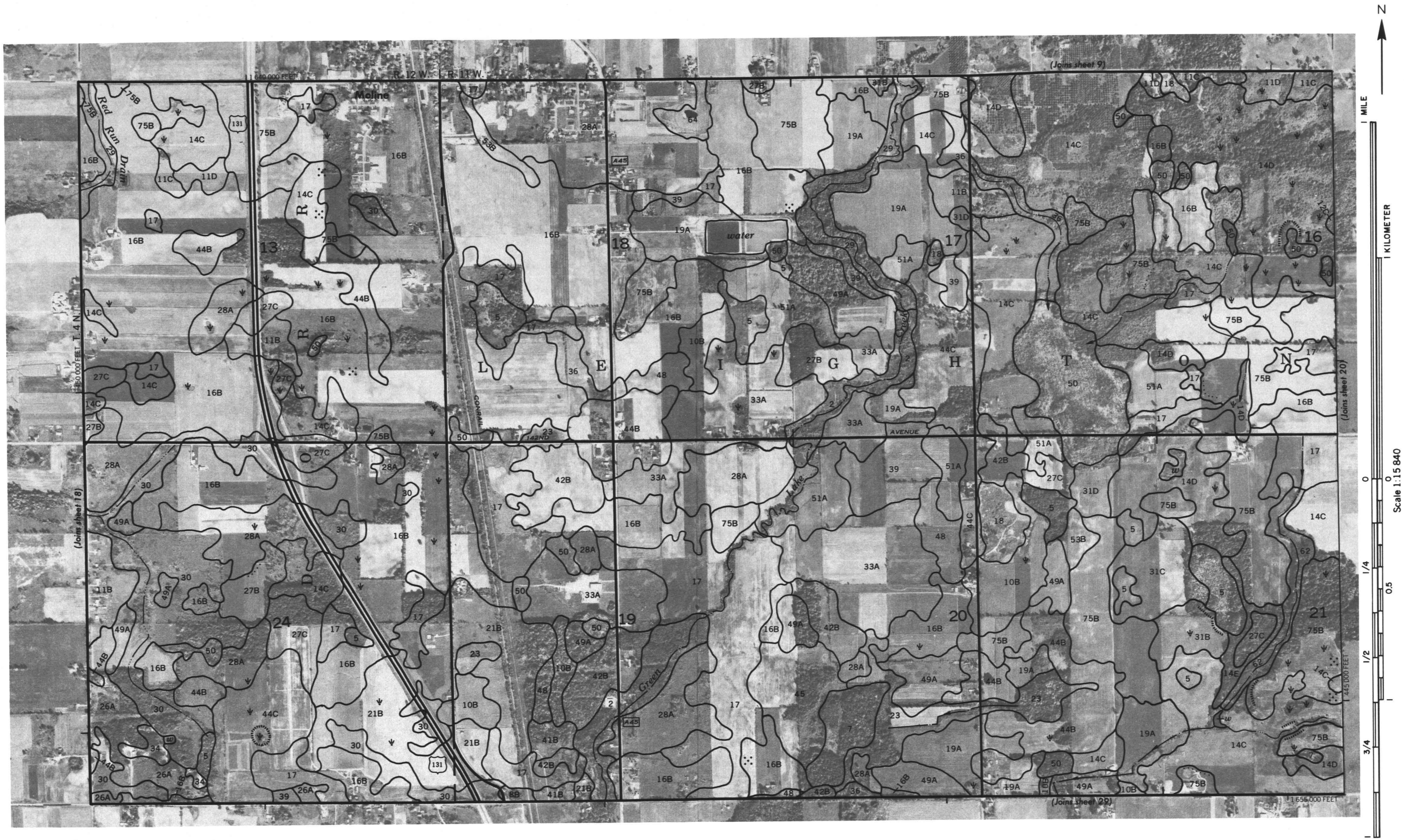
1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 1

0 0.5 1

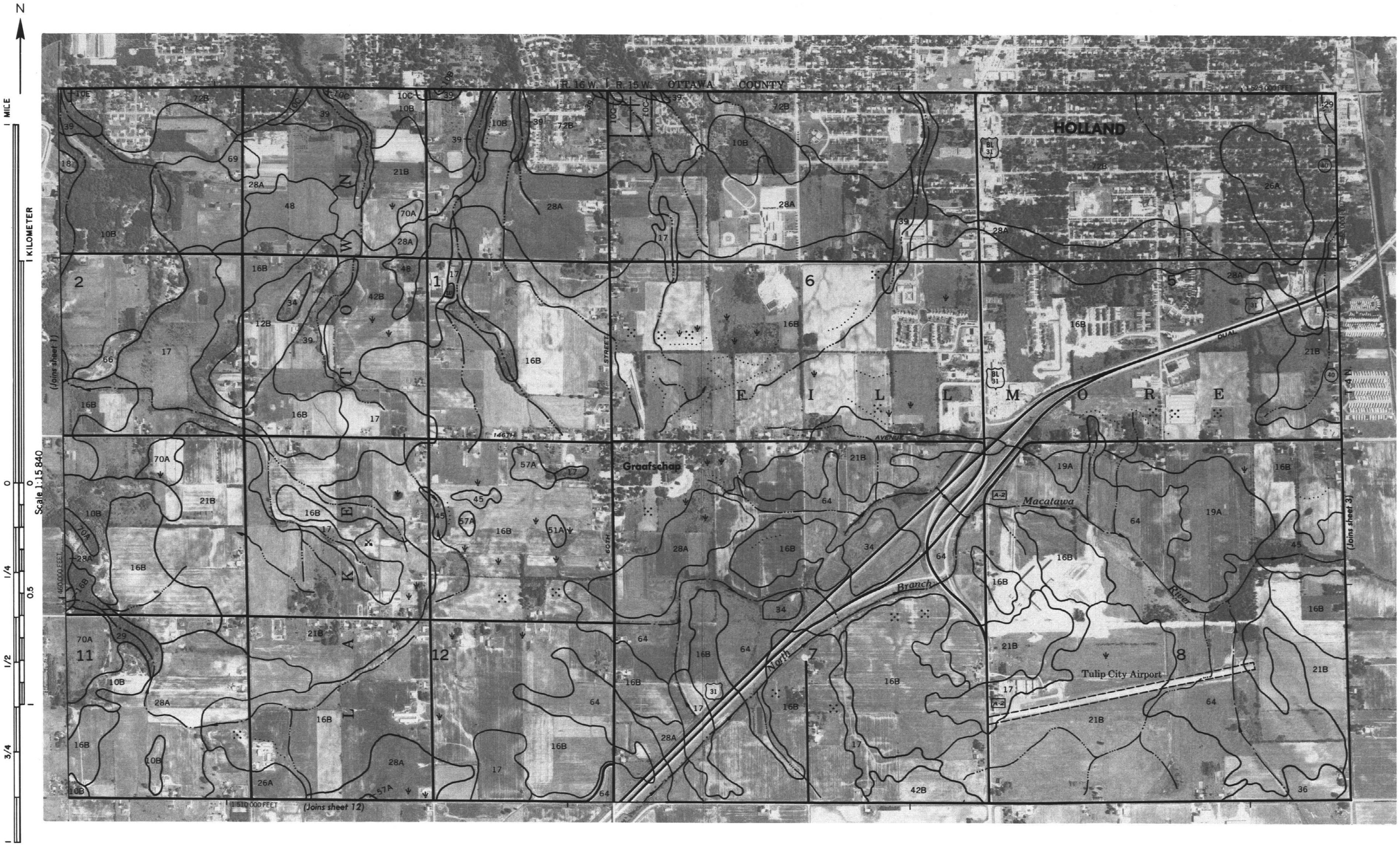
This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



ALLEGAN COUNTY, MICHIGAN NO. 19

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

2



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 2

20

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 20

N

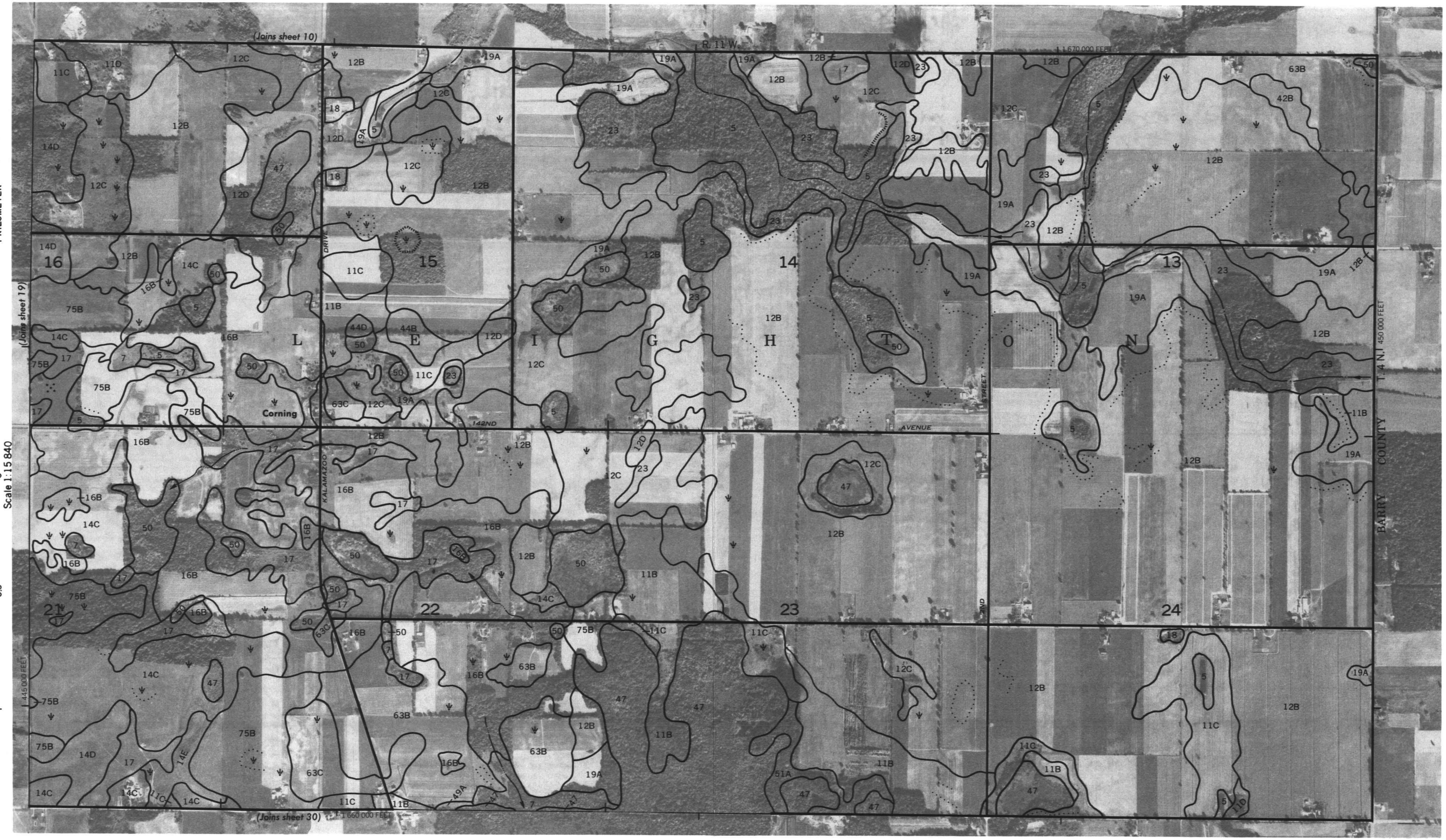
1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 1

0 0.5 1

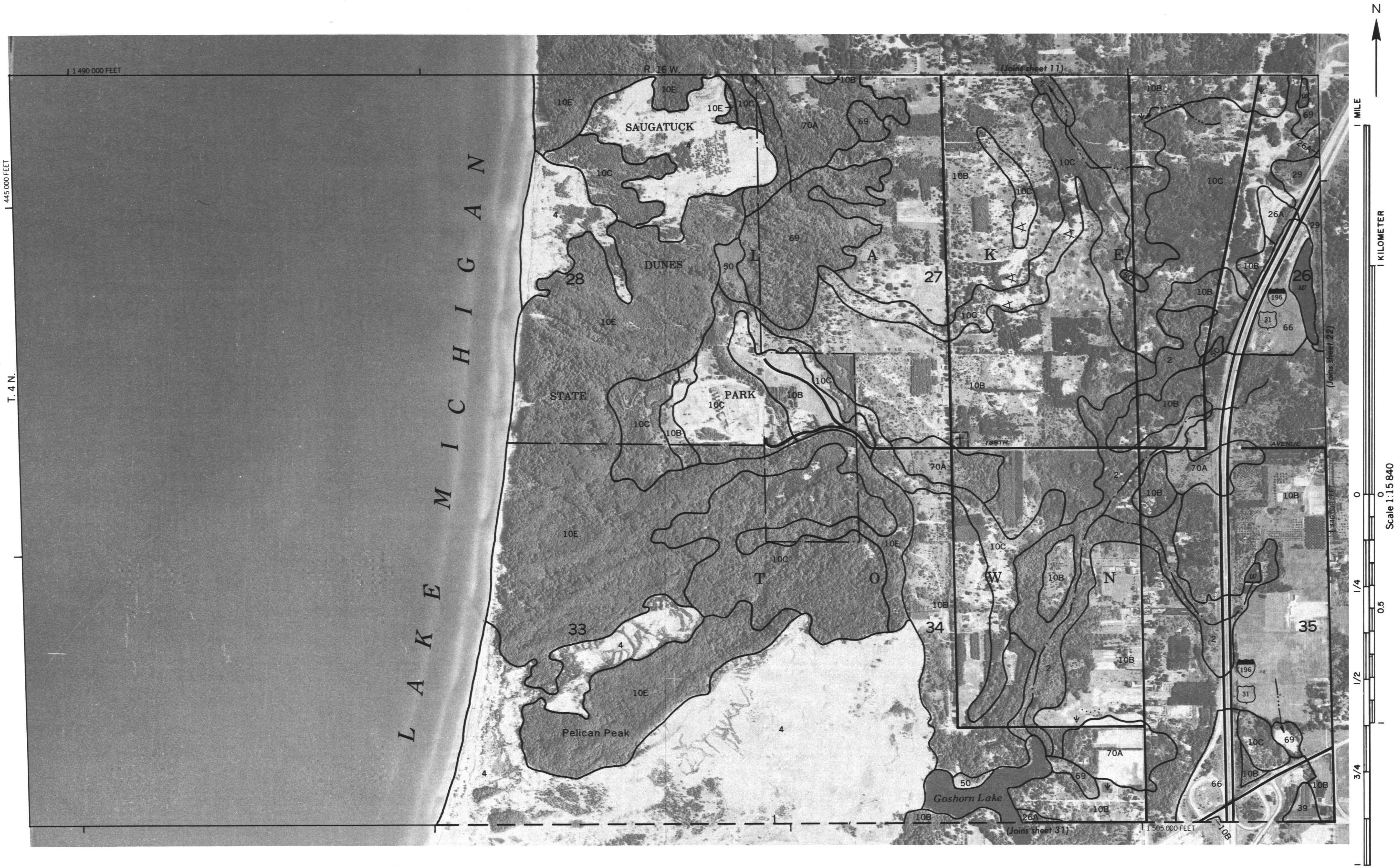


This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 20

ALLEGAN COUNTY, MICHIGAN NO. 21

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 22

This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 23

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 24

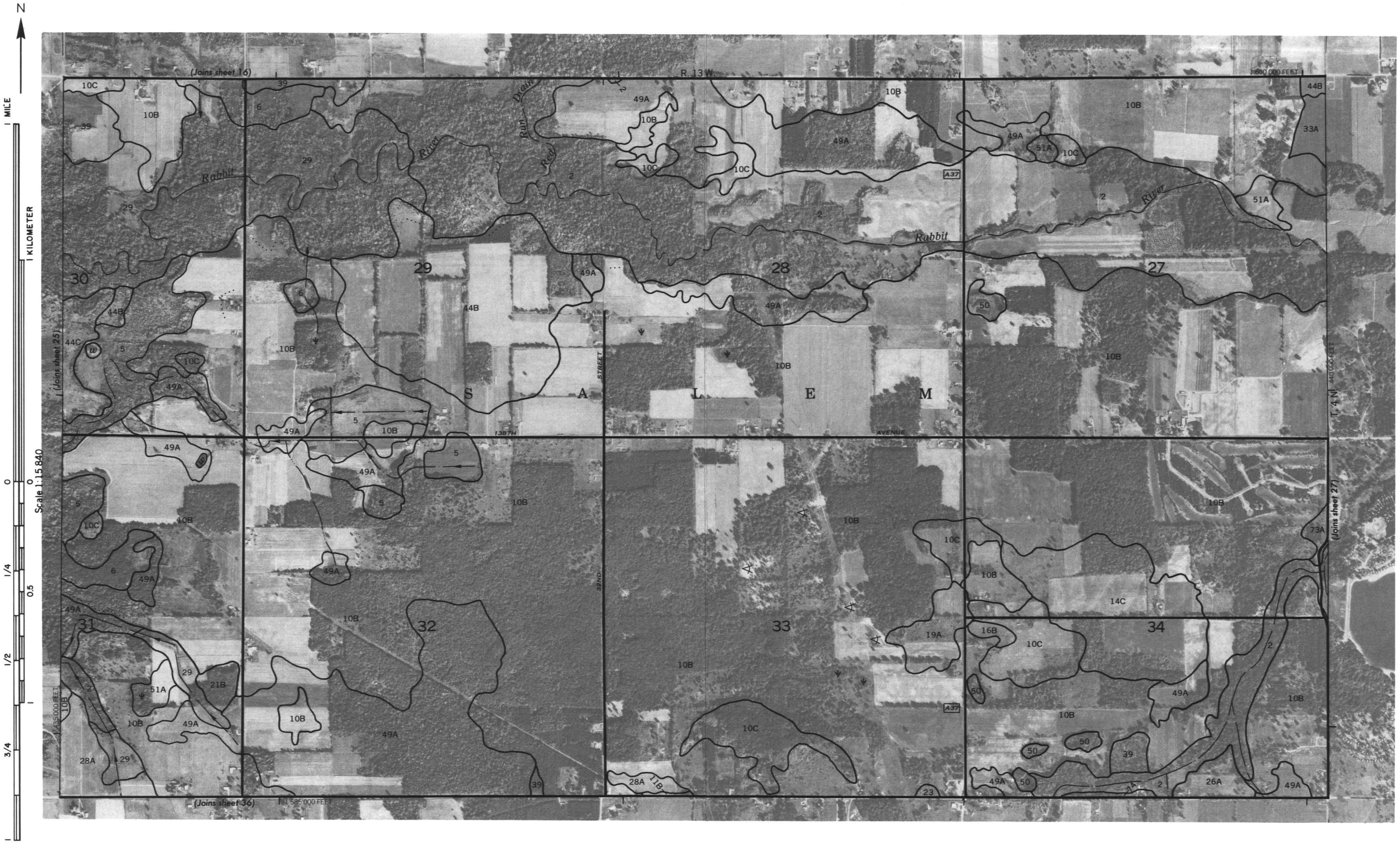
This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 25

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

26

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 26

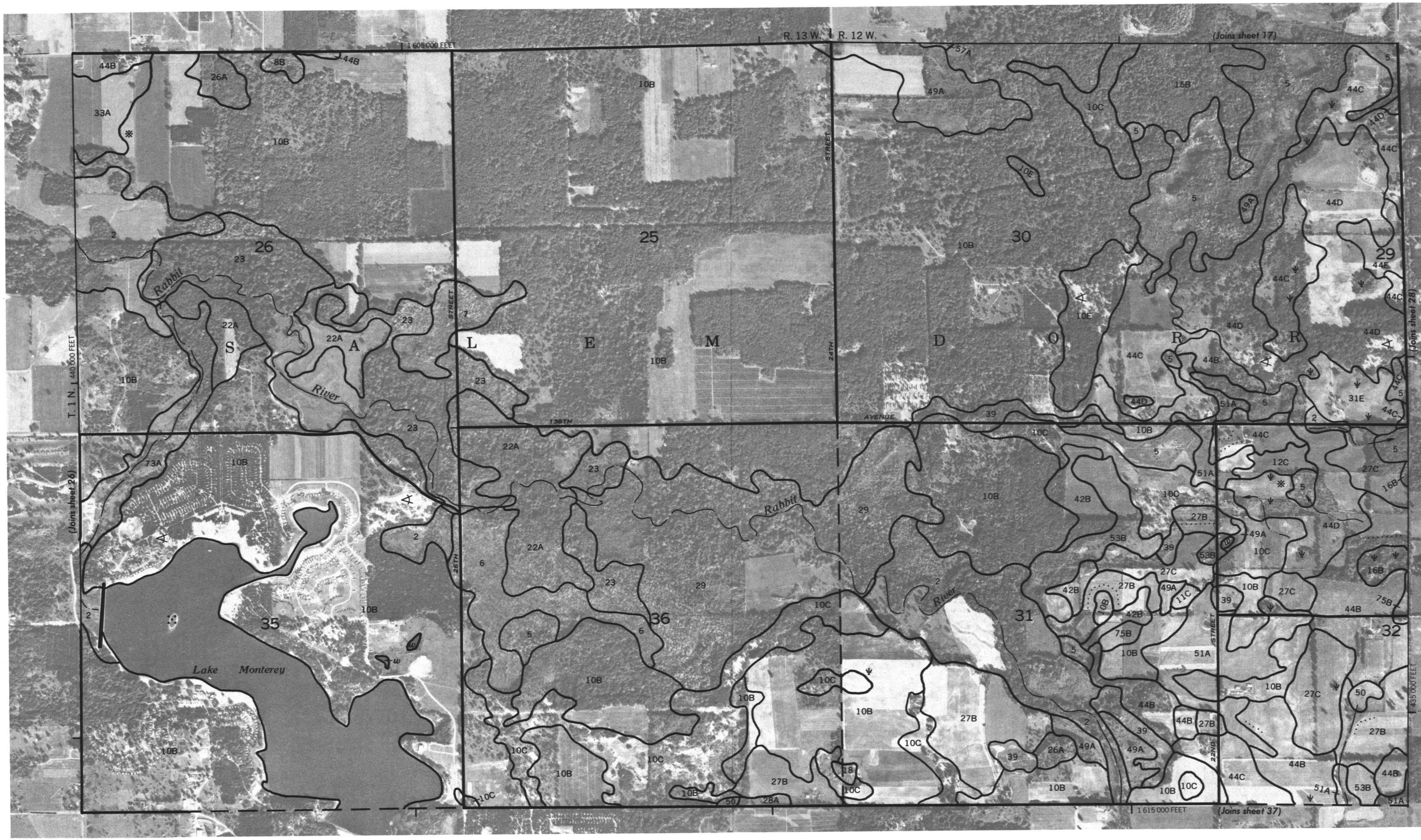


ALLEGAN COUNTY, MICHIGAN NO. 26

This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 27

(27)



N

1 MILE

1 KILOMETER

Scale 1:15 840

ALLEGAN COUNTY, MICHIGAN NO. 27

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 28

N

1 MILE

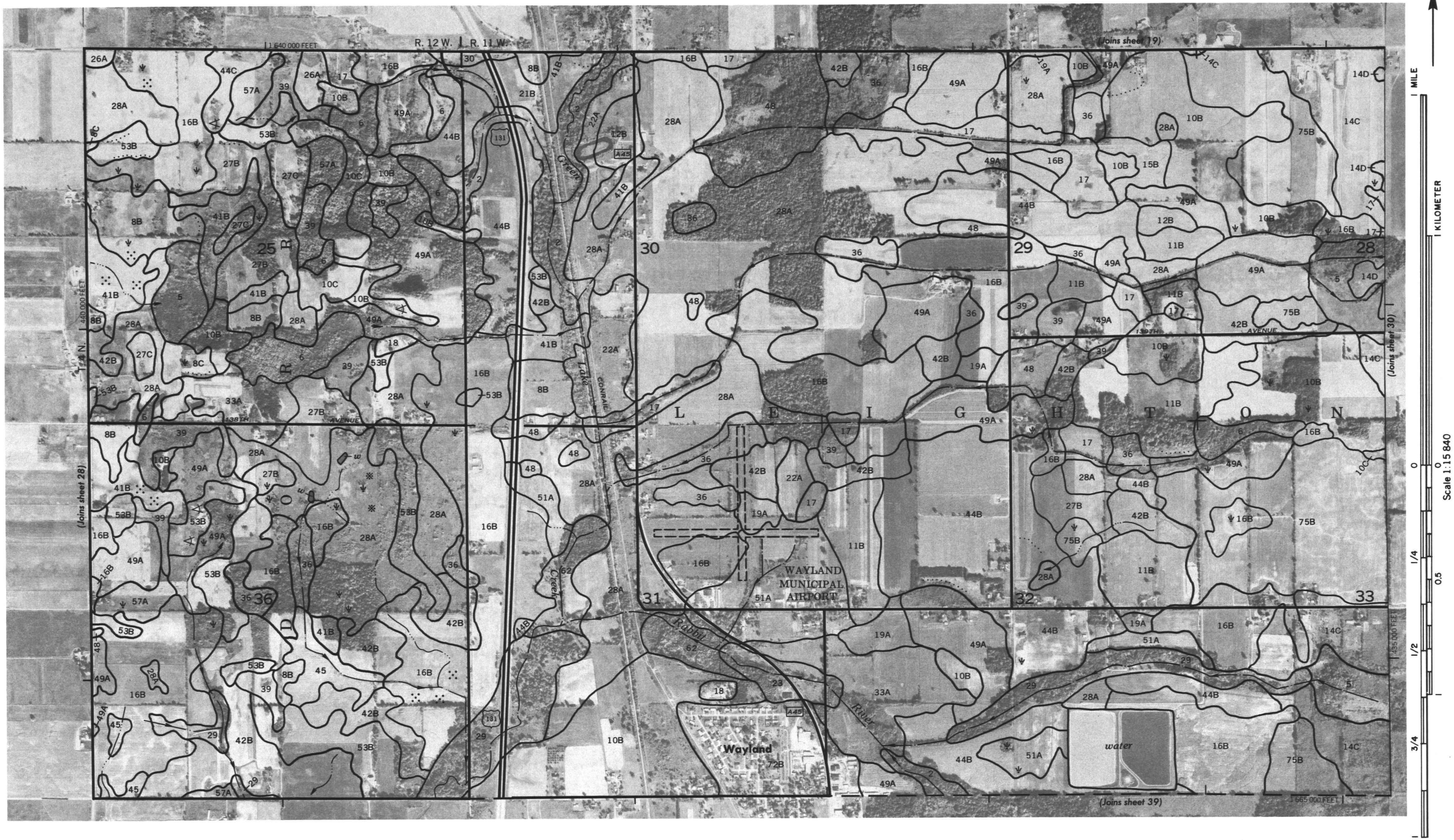
1 KILOMETER

Scale 1:15 840

This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 28

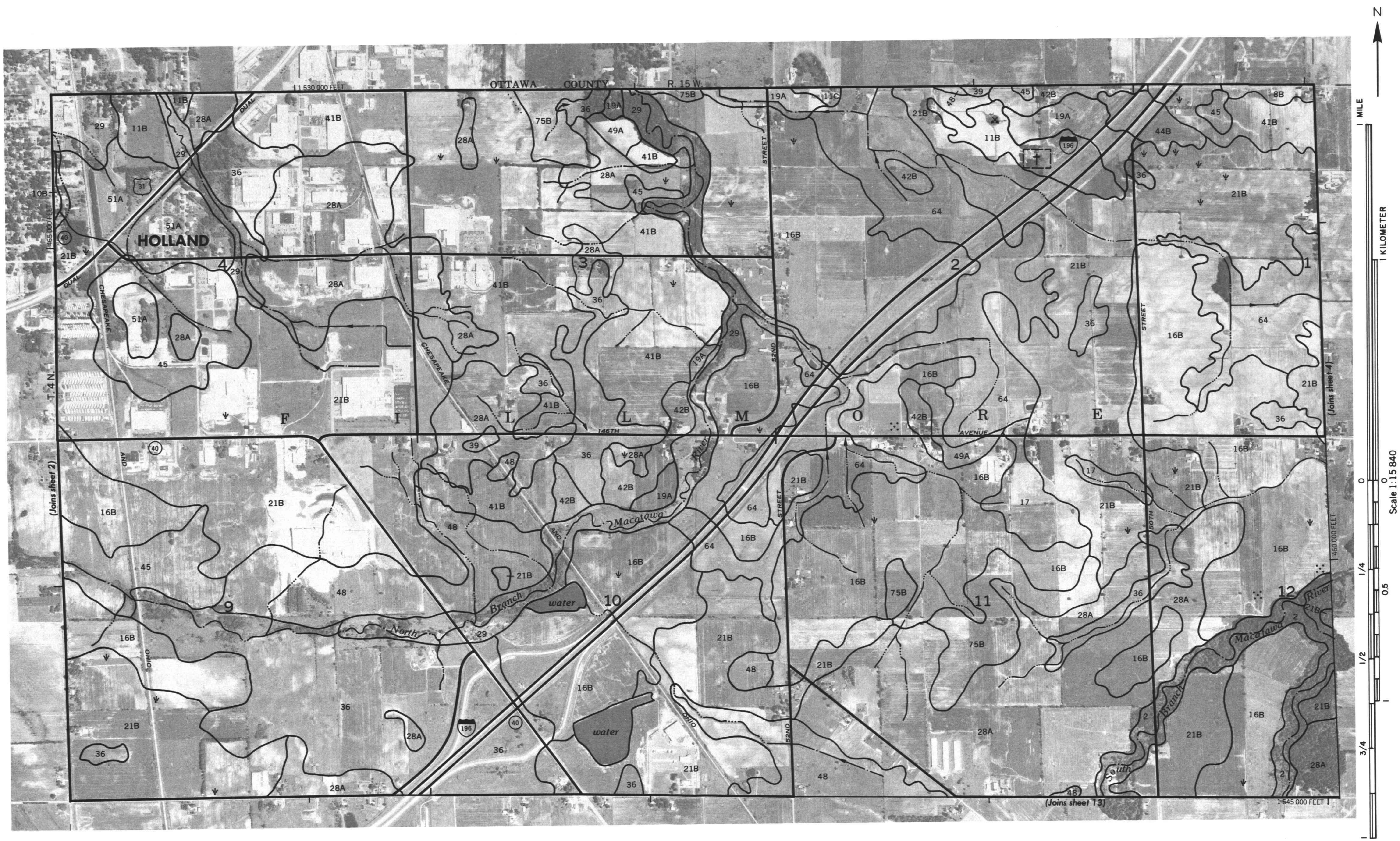
29



ALLEGAN COUNTY, MICHIGAN NO. 29

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 3



ALLEGAN COUNTY, MICHIGAN NO. 3

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 30

N

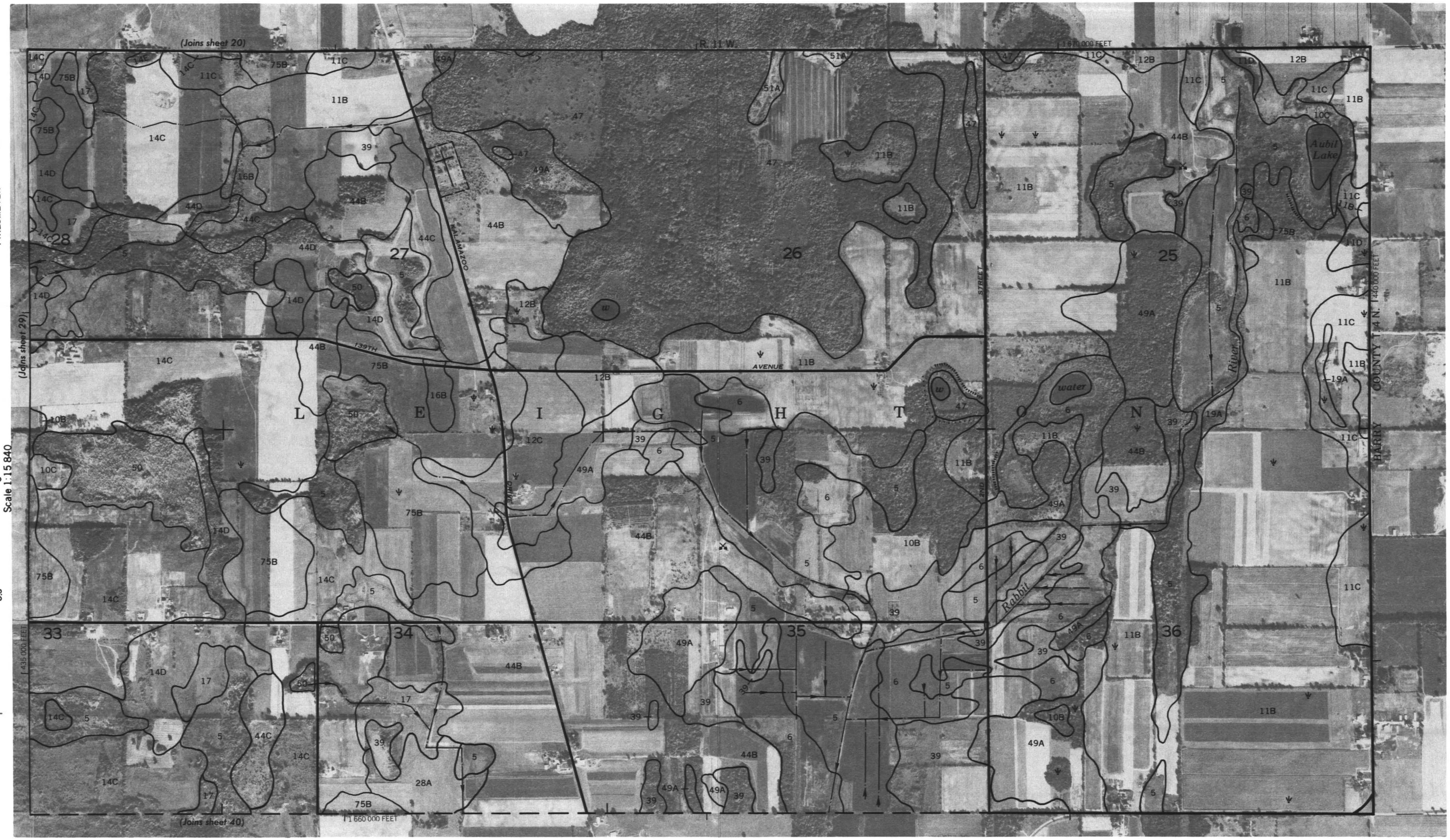
1 MILE

1 KILOMETER

Scale 1:15 840

0 — 1/4 — 1/2 — 3/4 — 1

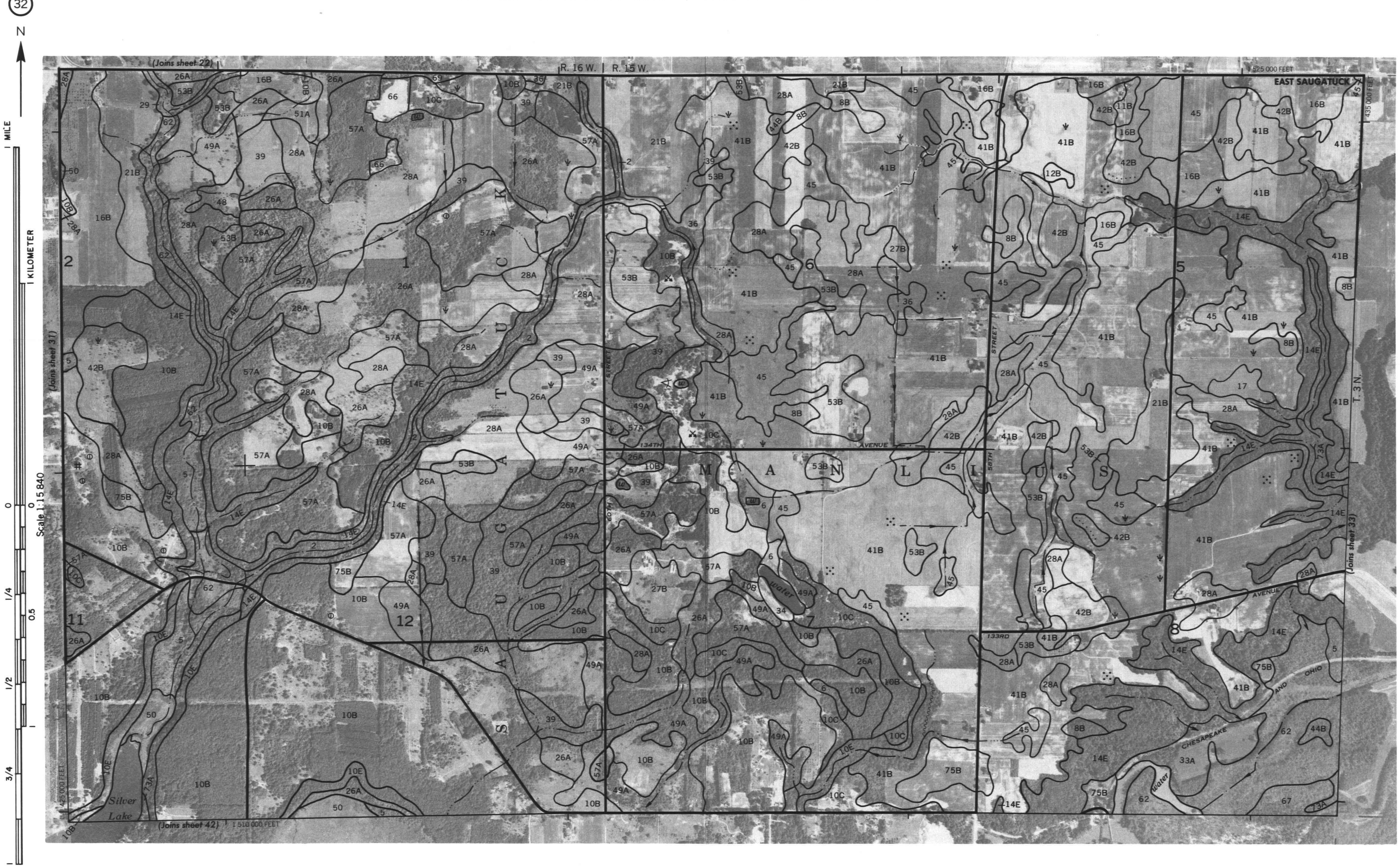
0 — 0.5 — 1



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

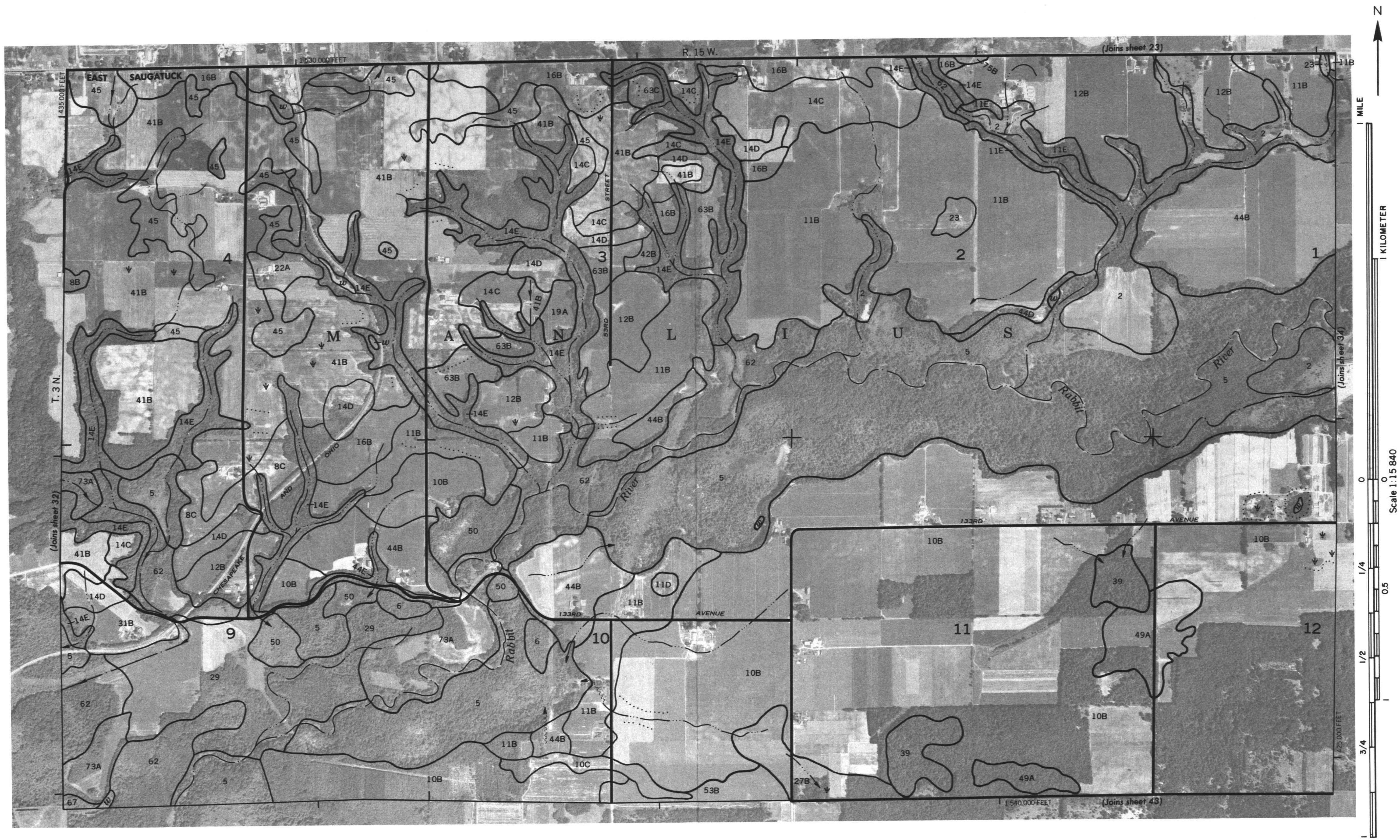
ALLEGAN COUNTY, MICHIGAN NO. 31

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 32



ALLEGAN COUNTY, MICHIGAN NO. 33

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

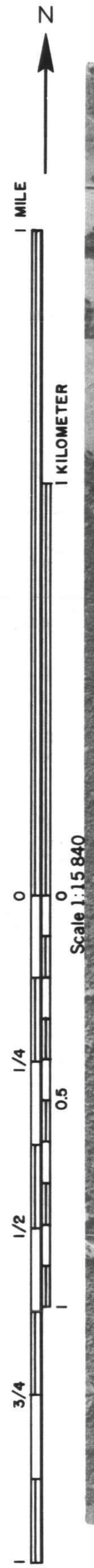
SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 34

This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

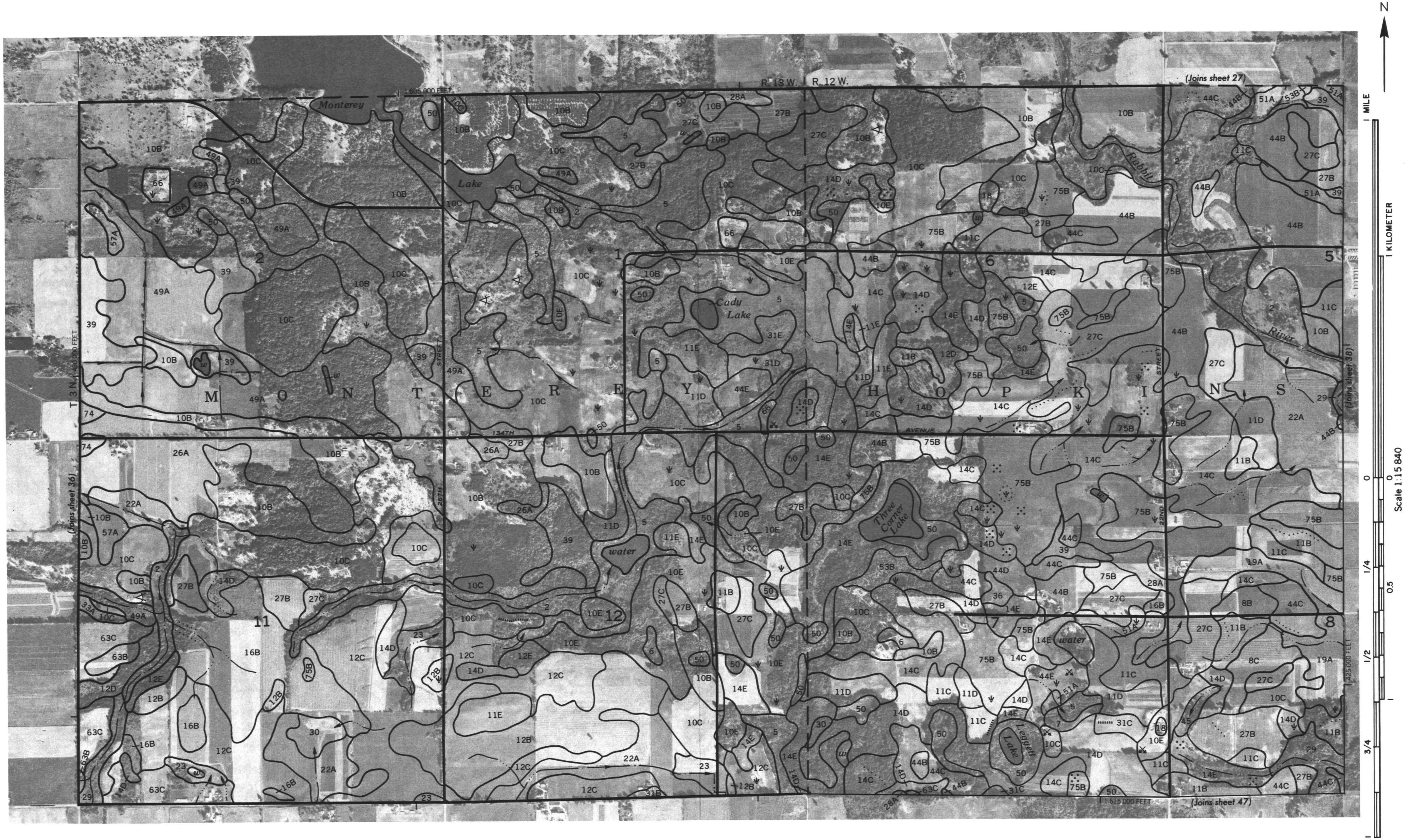
ALLEGAN COUNTY, MICHIGAN NO. 35

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 36



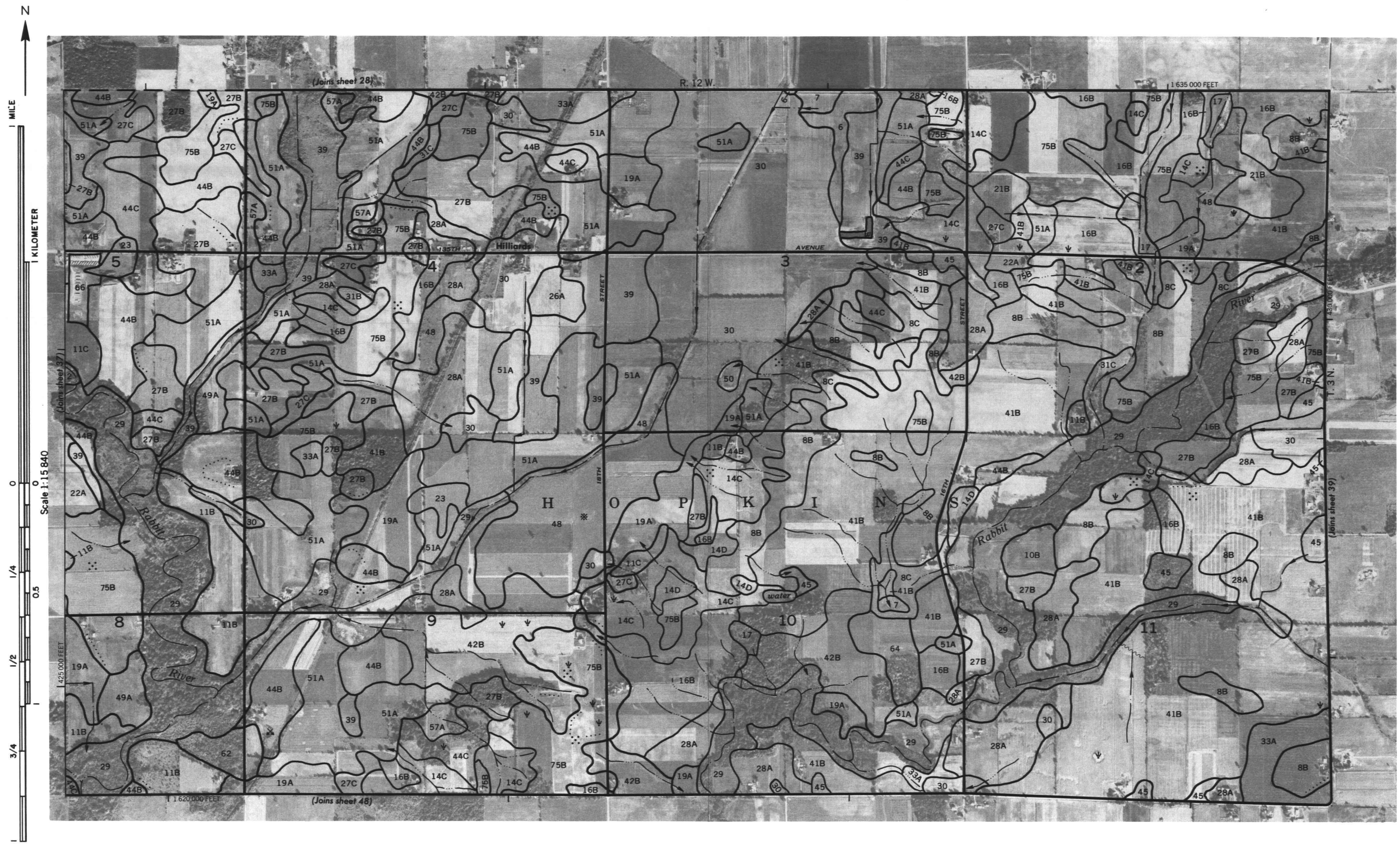
This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



ALLEGAN COUNTY, MICHIGAN NO. 37

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 38



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 38

39

N

1 MILE

1 KILOMETER

Scale 1:15 840

ALLEGAN COUNTY, MICHIGAN NO. 39

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

4

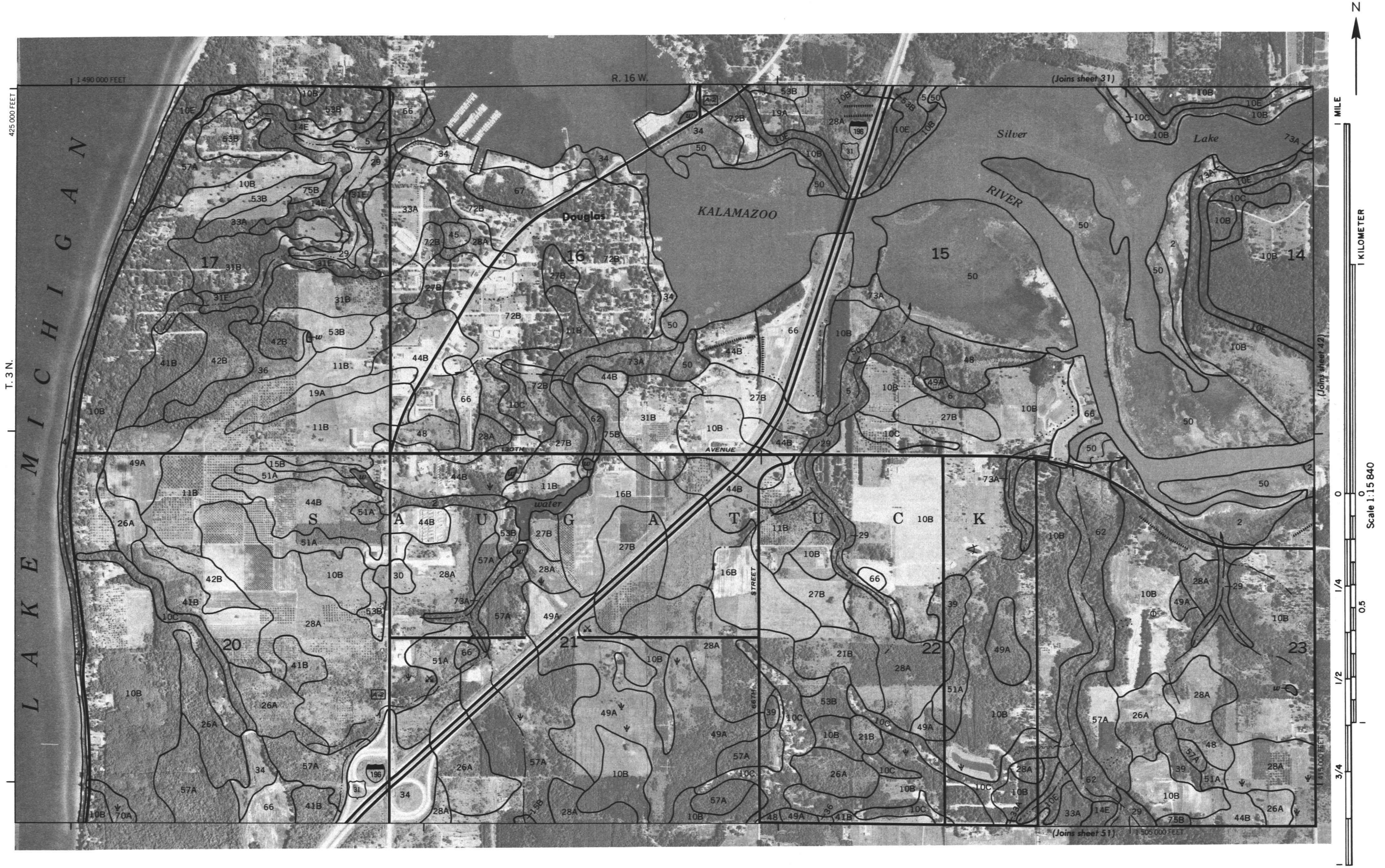
SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 4

This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 4

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 40

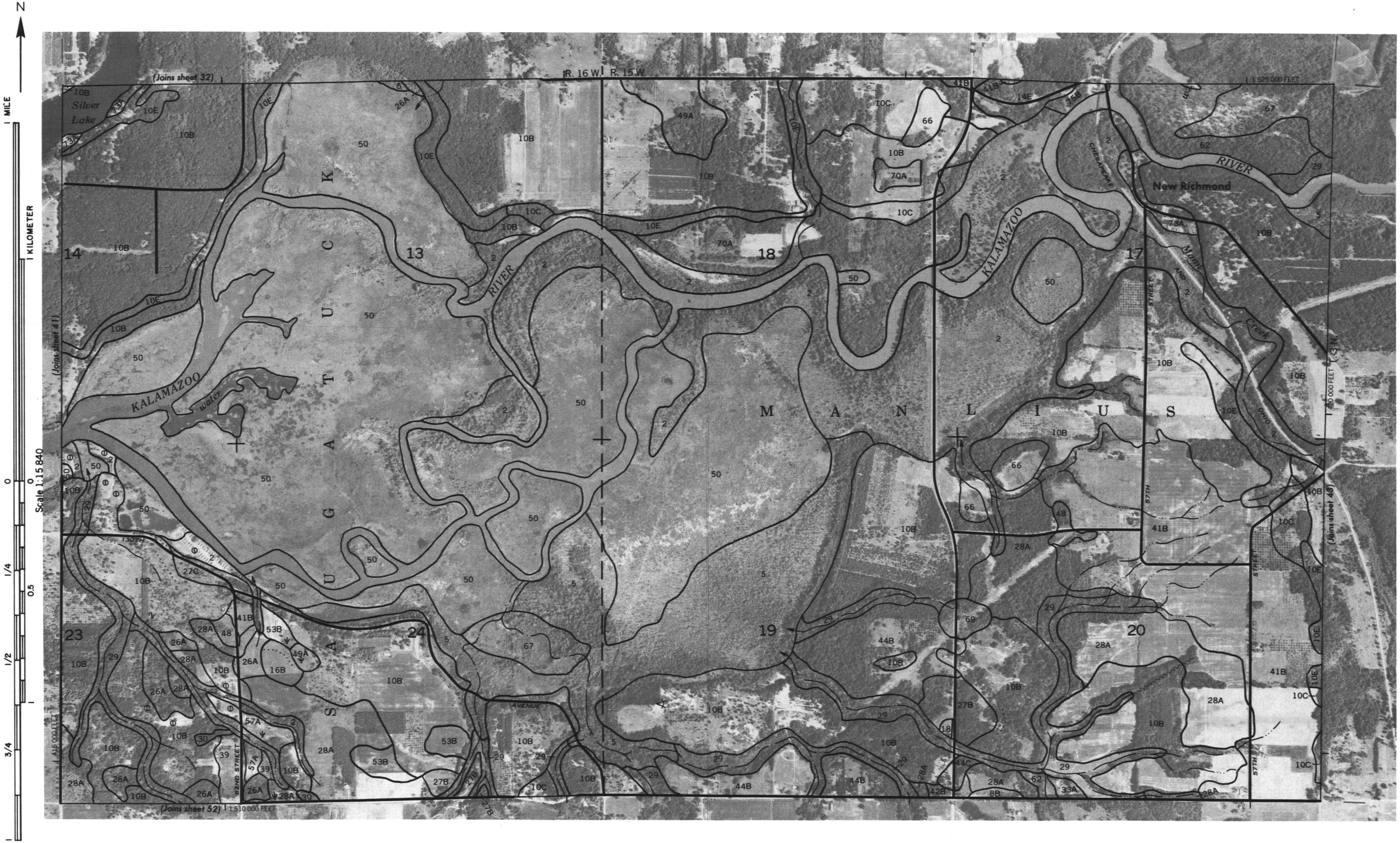
This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



ALLEGAN COUNTY, MICHIGAN NO. 41

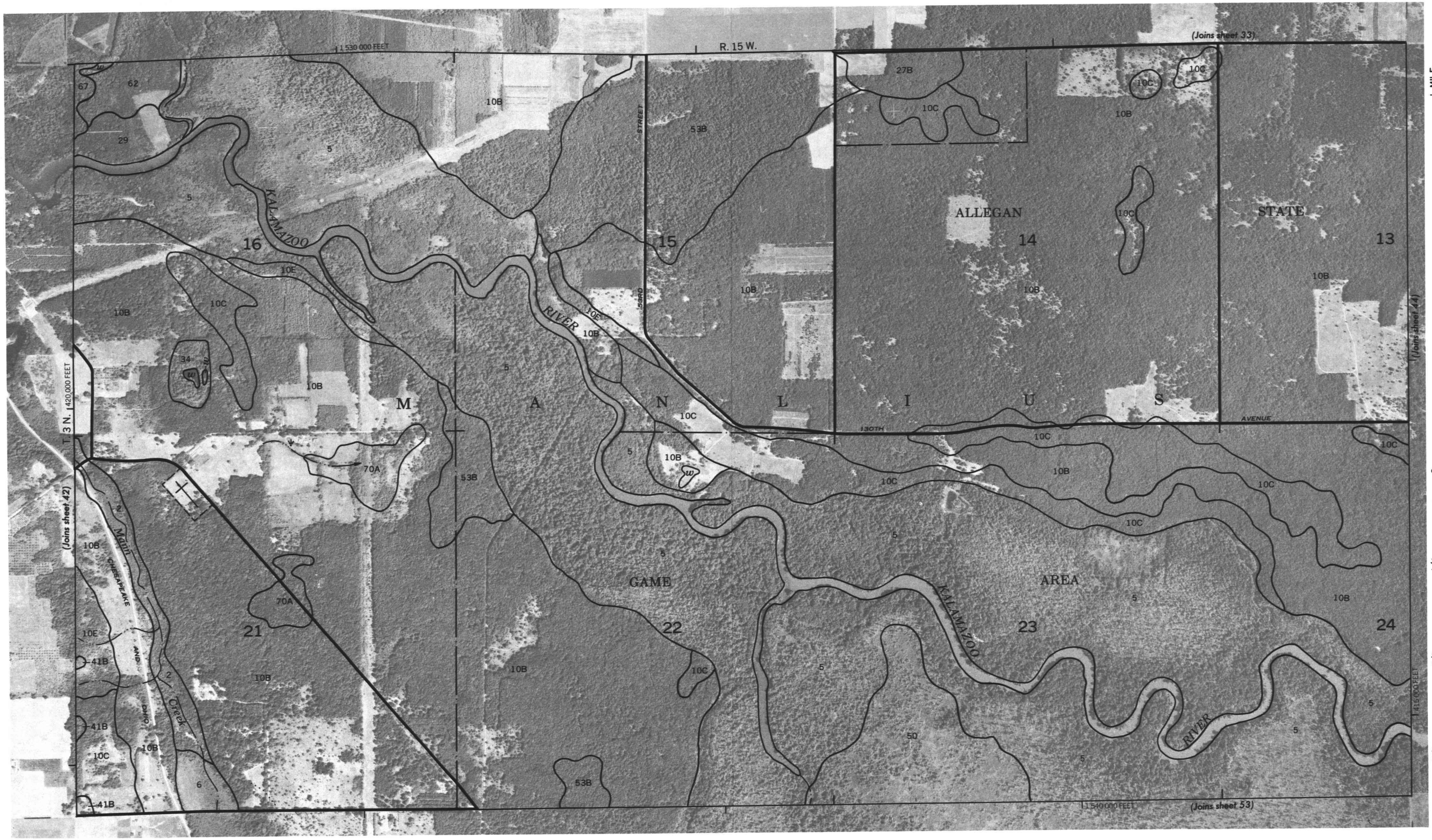
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 42



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

43



N

1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 1

0 0.5 1

ALLEGAN COUNTY, MICHIGAN NO. 43

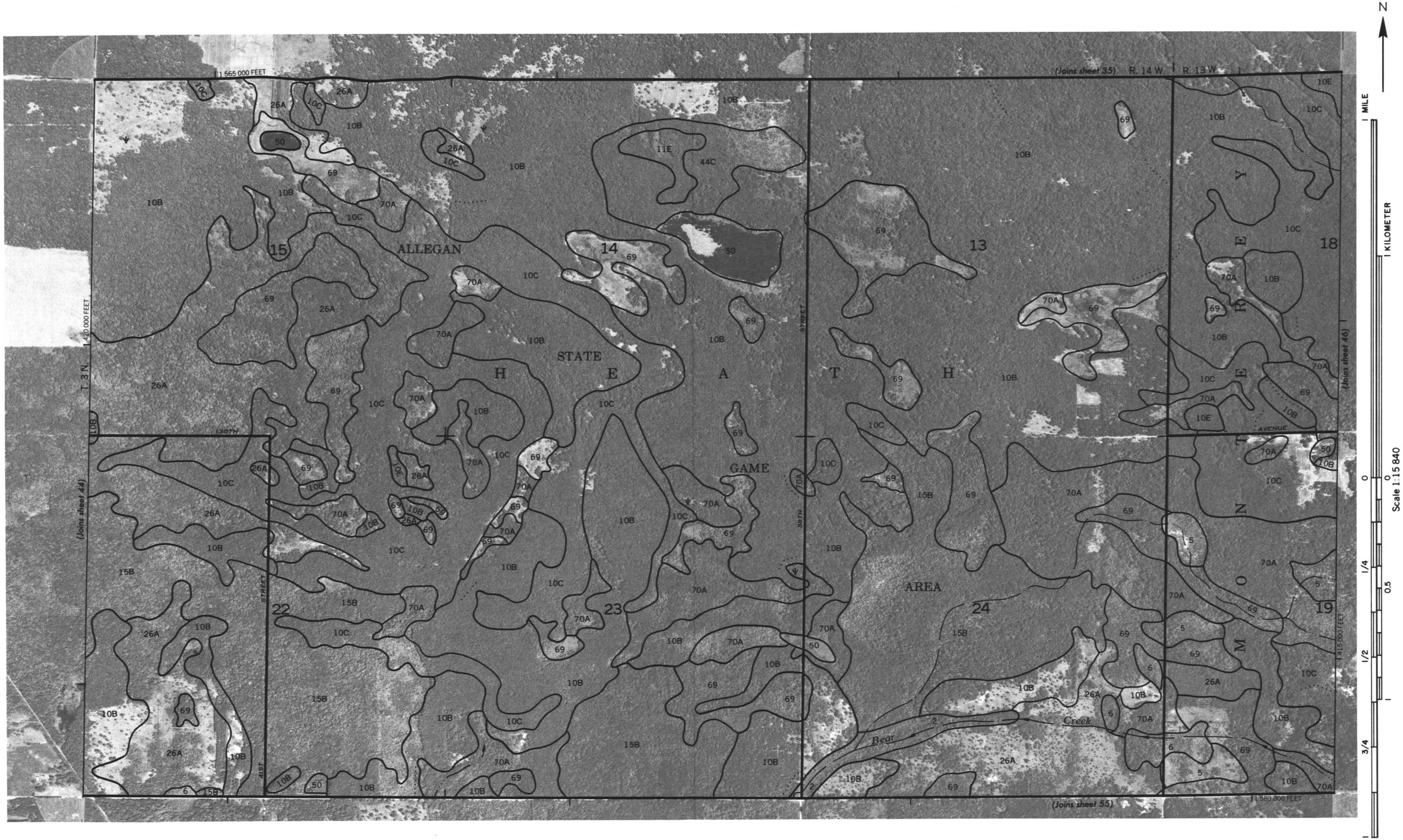
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

44

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 44

This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

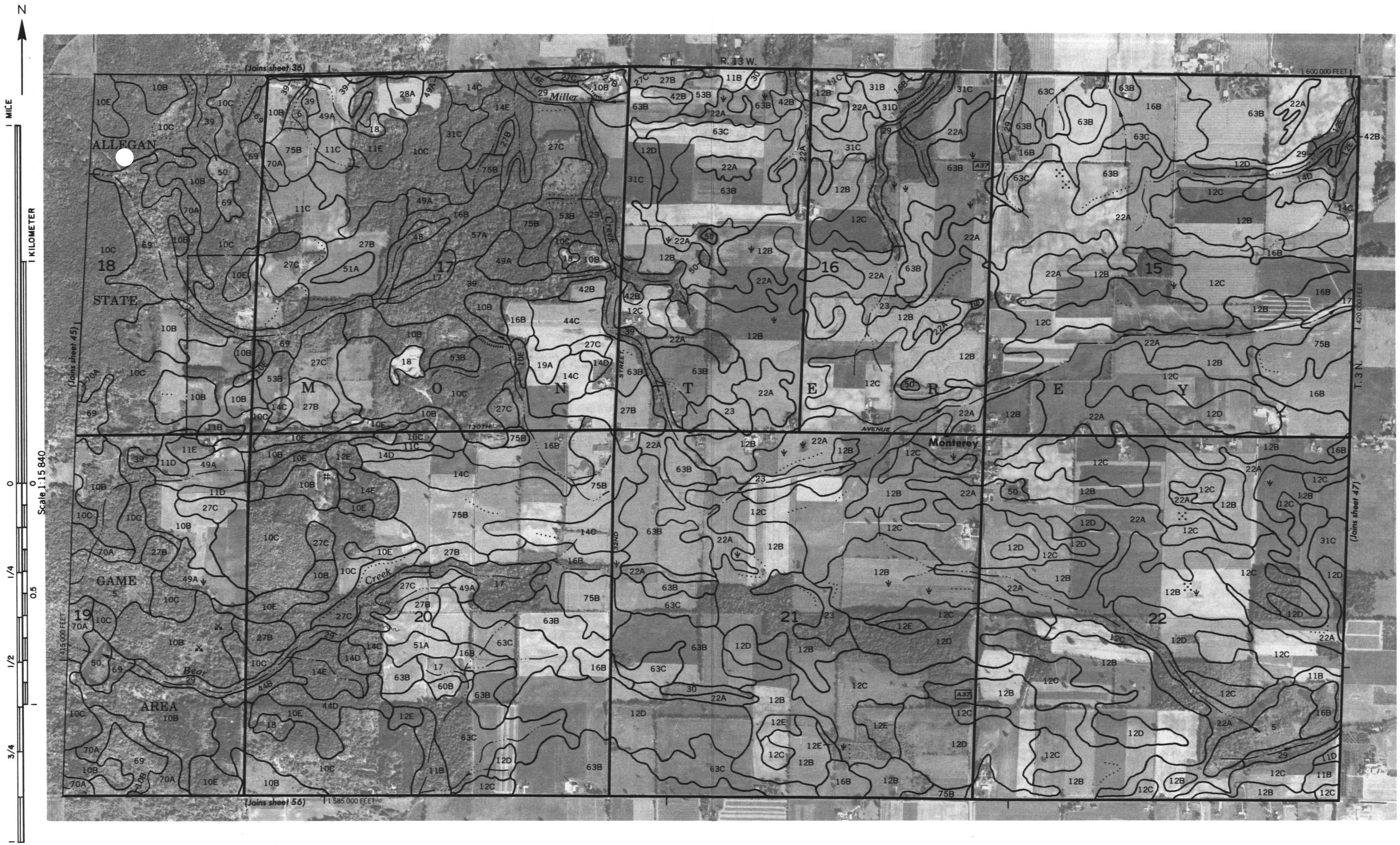
ALLEGAN COUNTY, MICHIGAN NO. 44



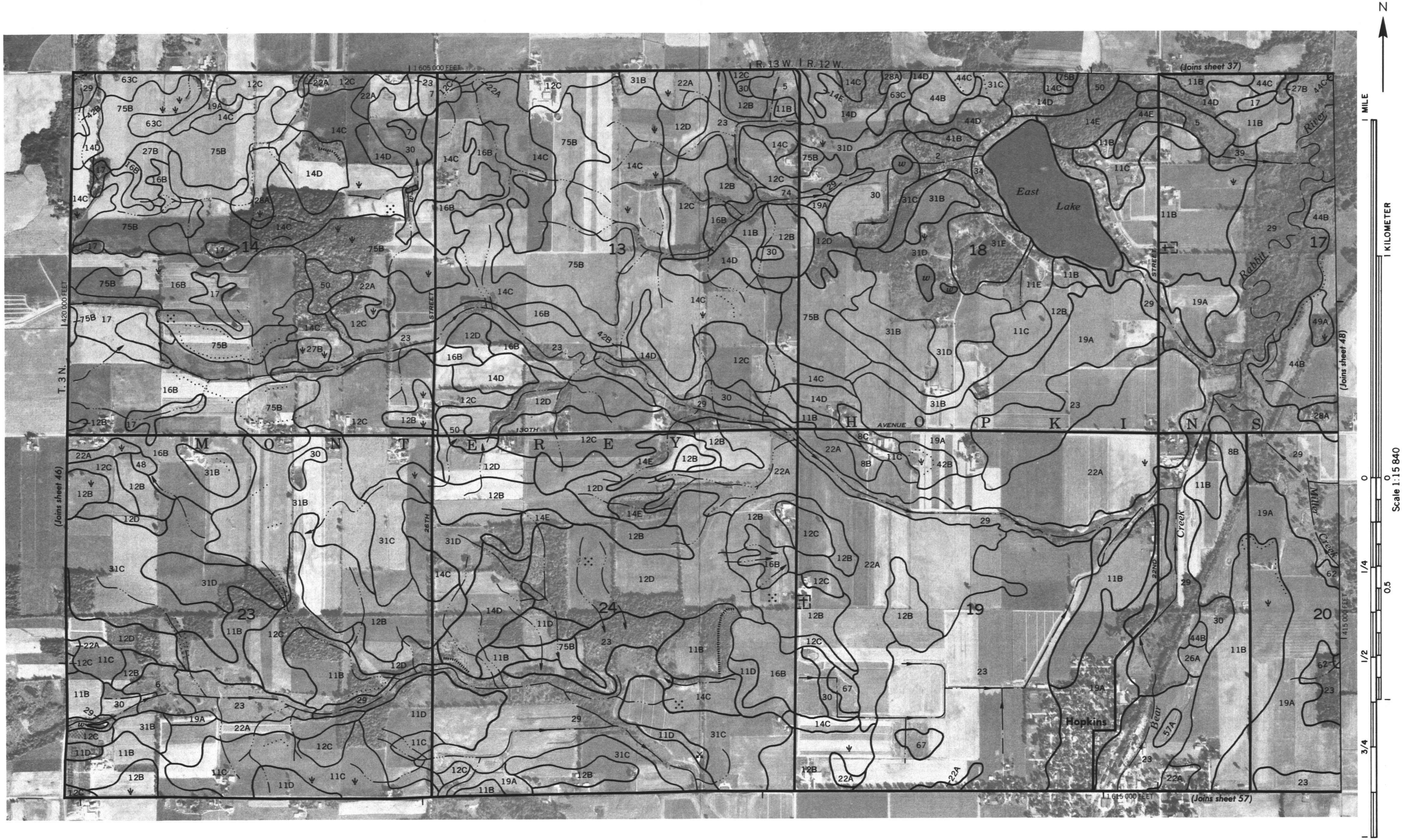
ALLEGAN COUNTY, MICHIGAN NO. 45

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 46

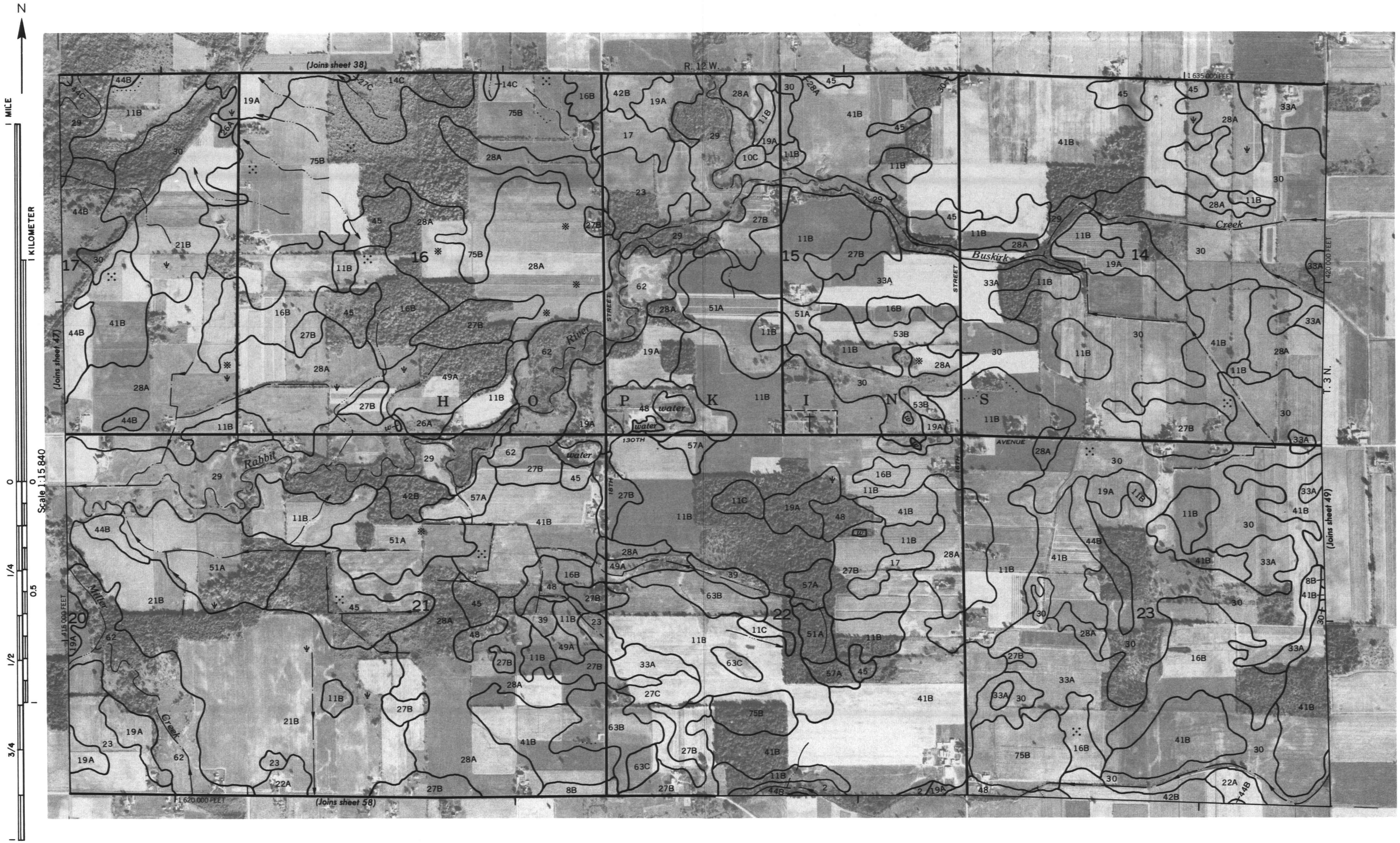


This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



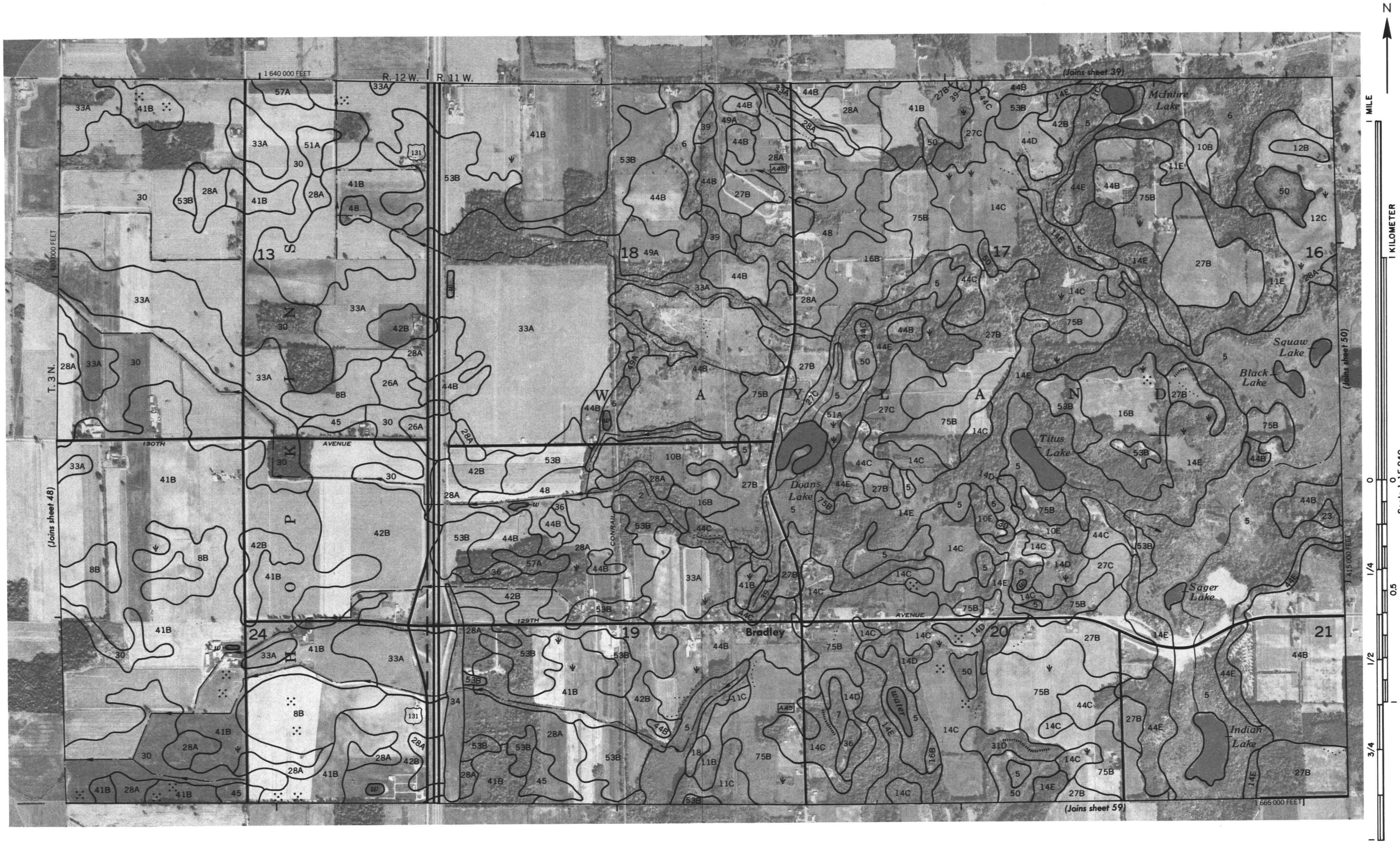
ALLEGAN COUNTY, MICHIGAN NO. 47

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

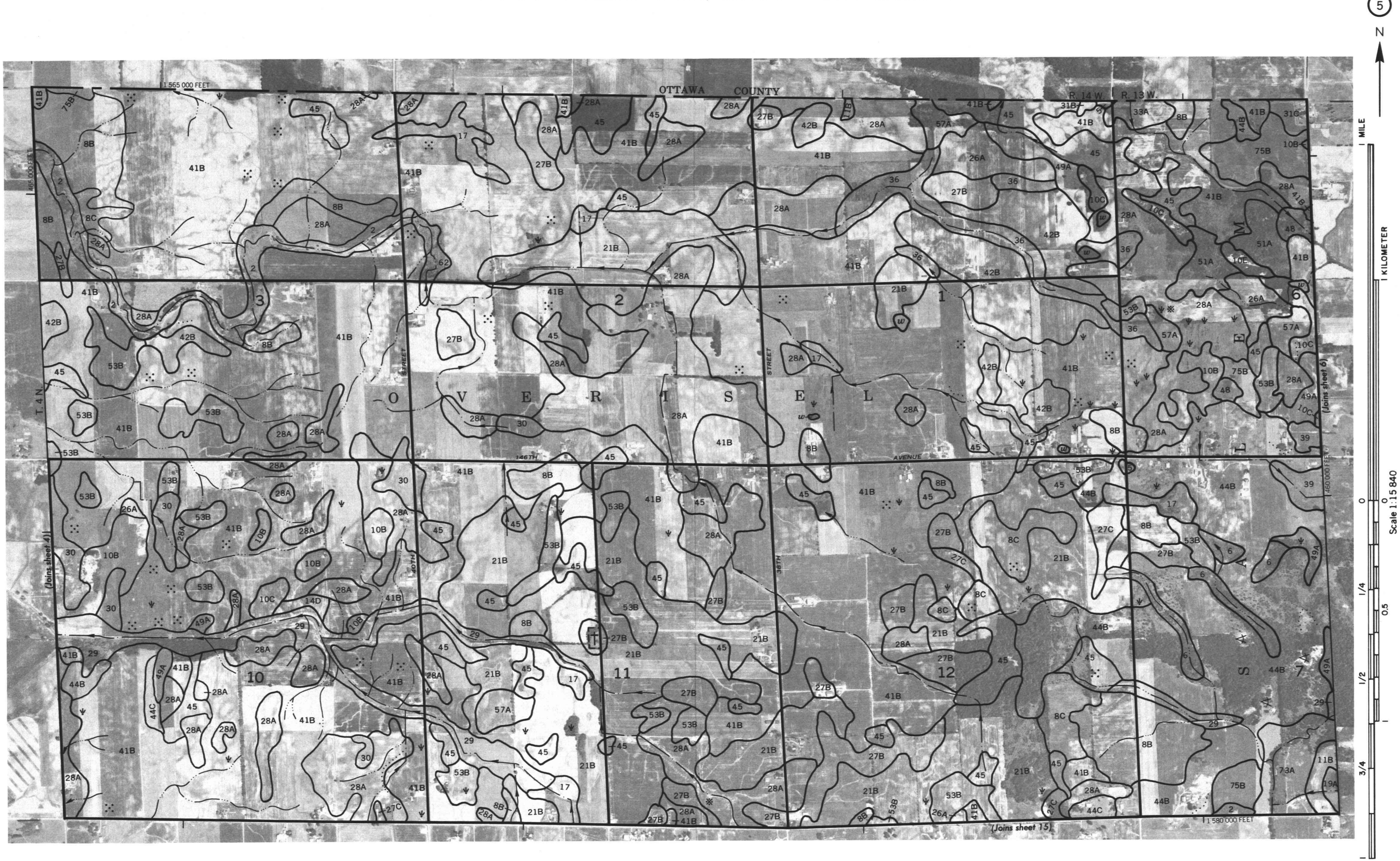
ALLEGAN COUNTY, MICHIGAN NO. 48



ALLEGAN COUNTY, MICHIGAN NO. 49

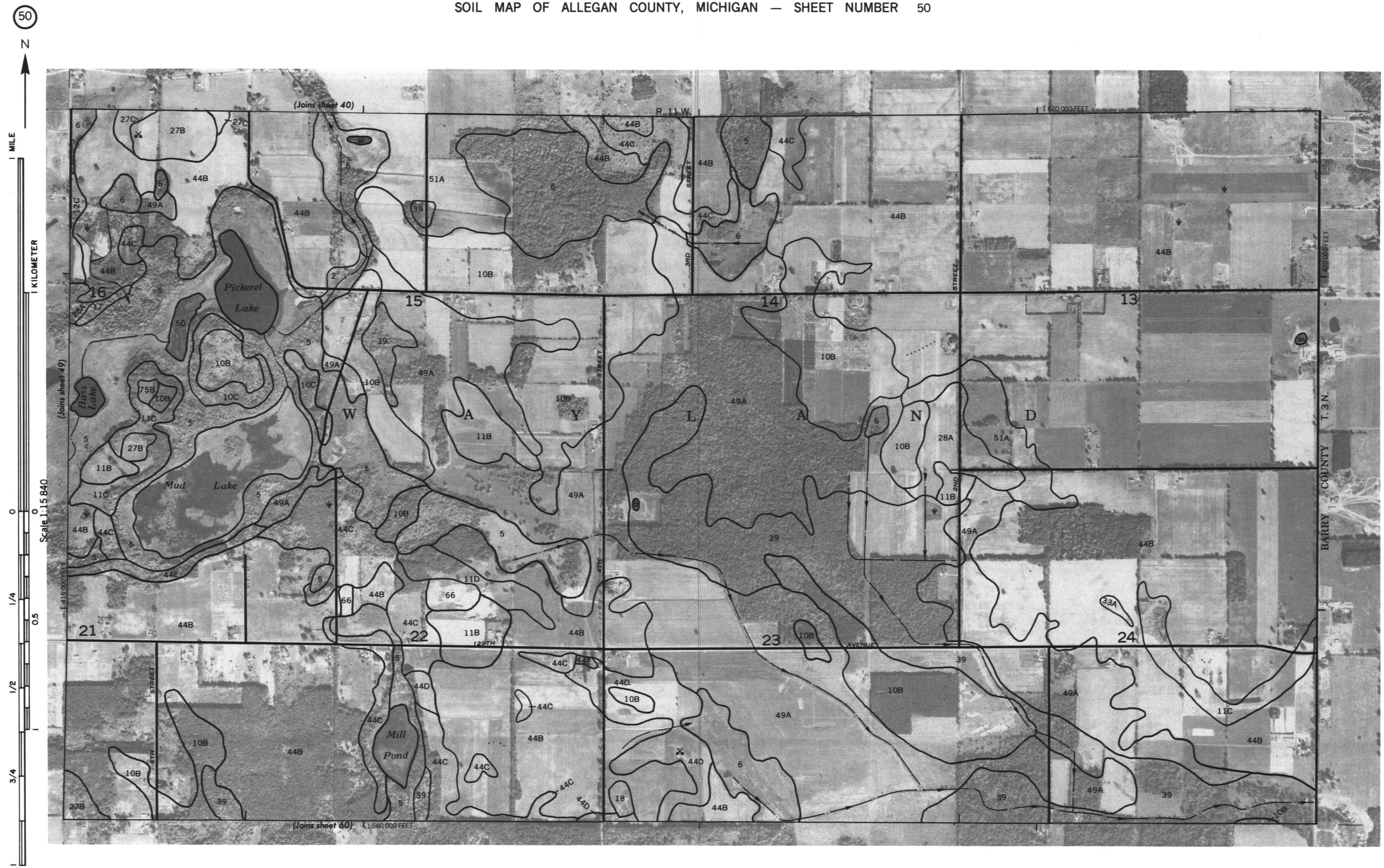
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 5



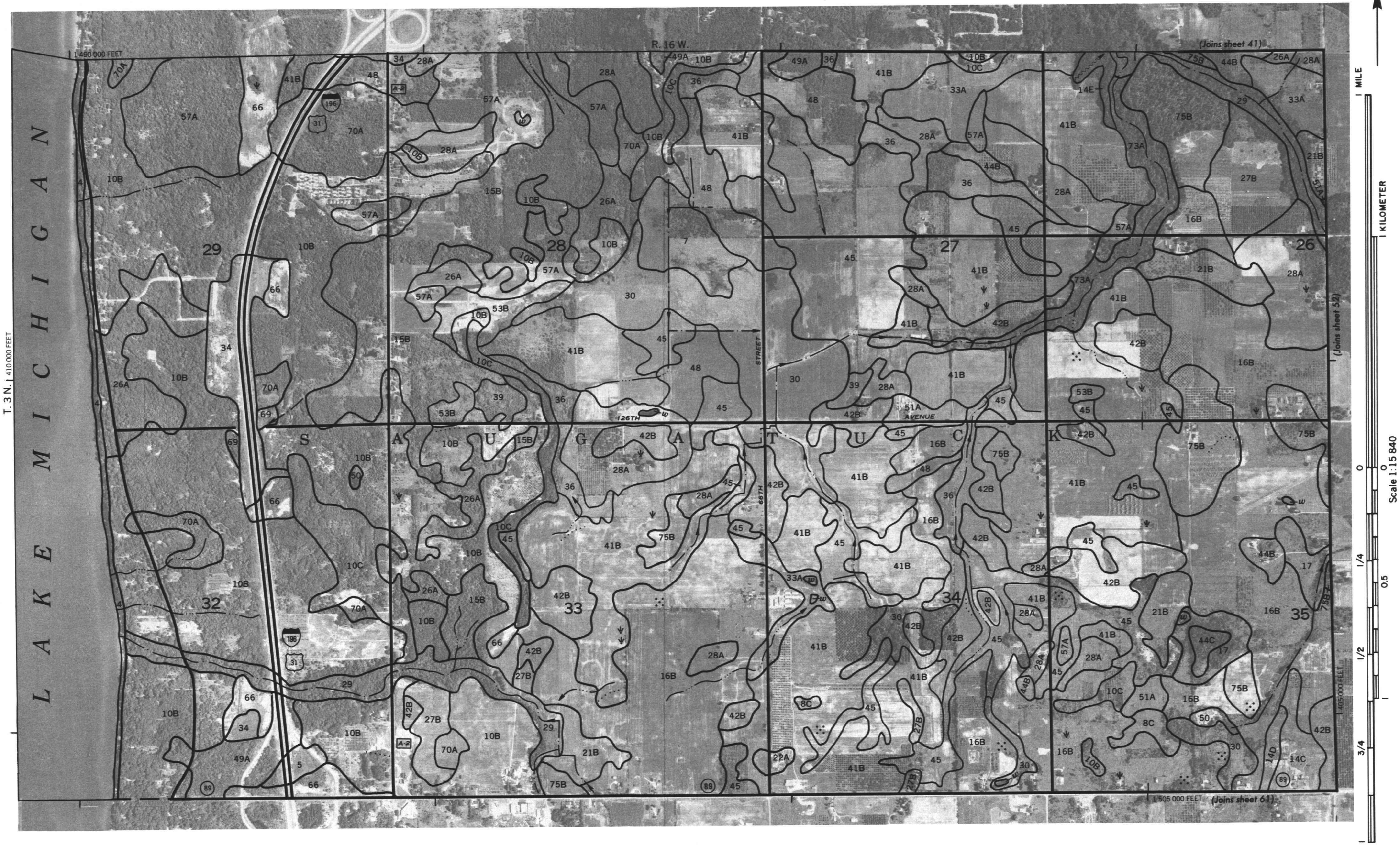
ALLEGAN COUNTY, MICHIGAN NO. 5

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

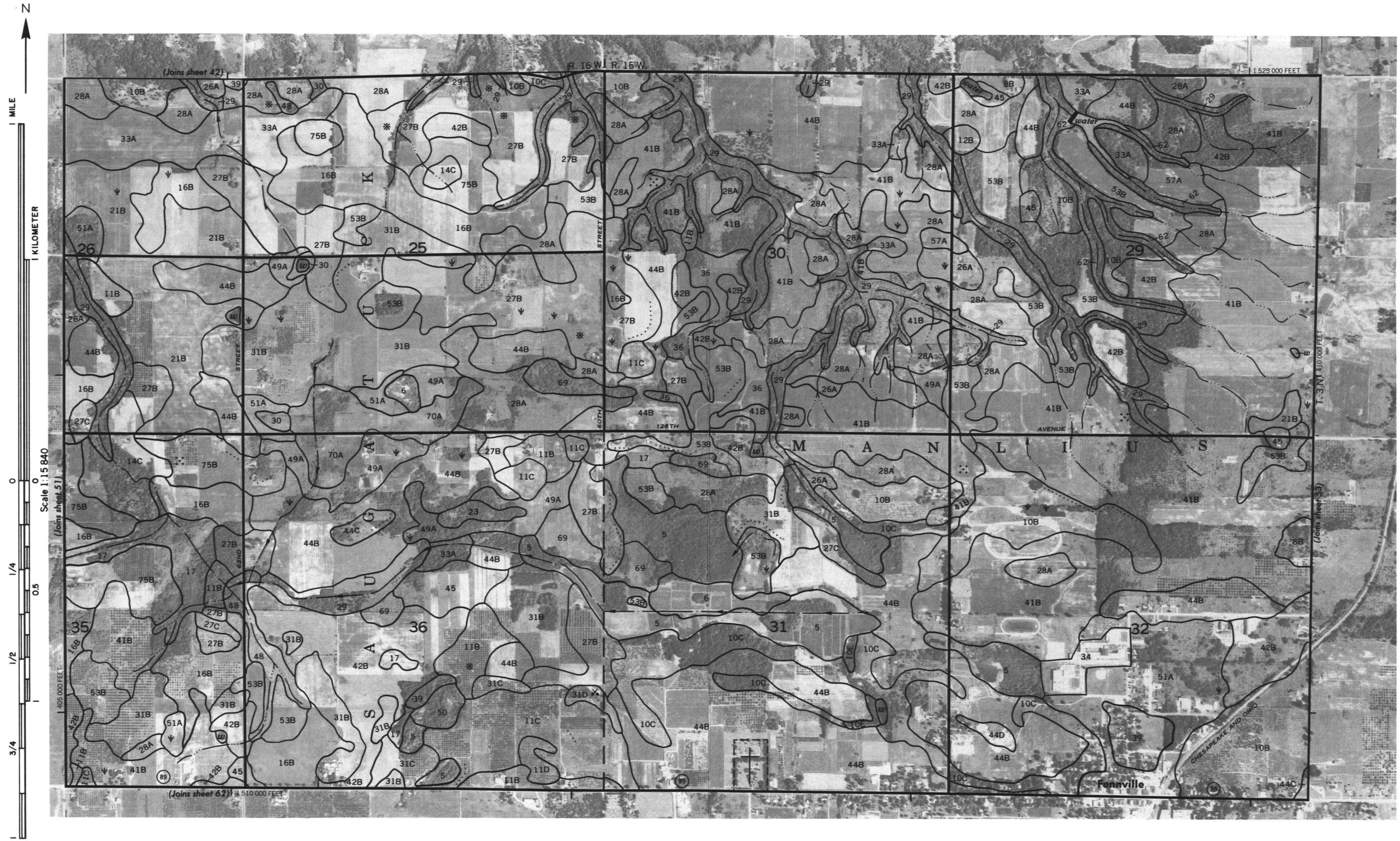
SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 51



ALLEGAN COUNTY, MICHIGAN NO. 51

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 52

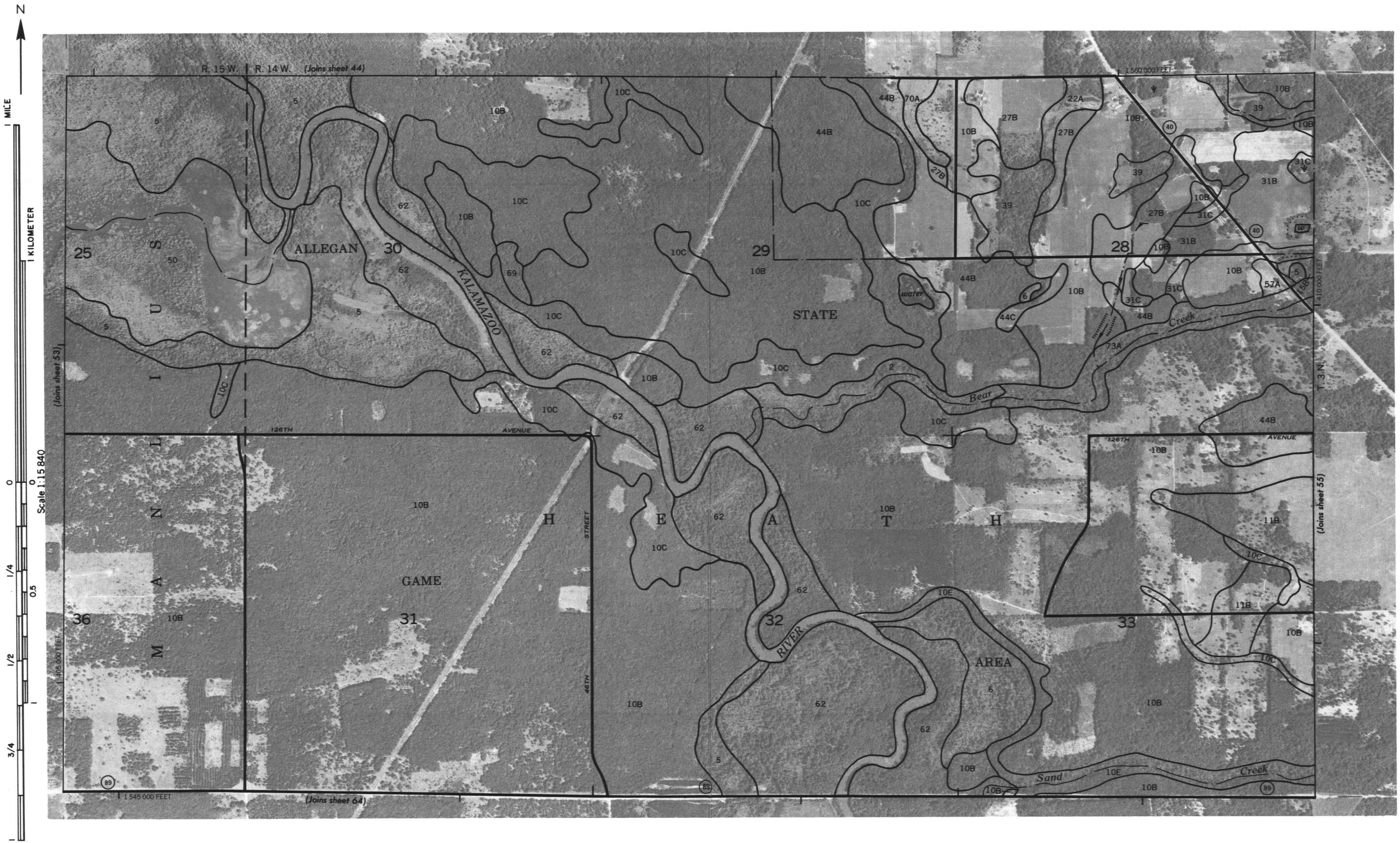


This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

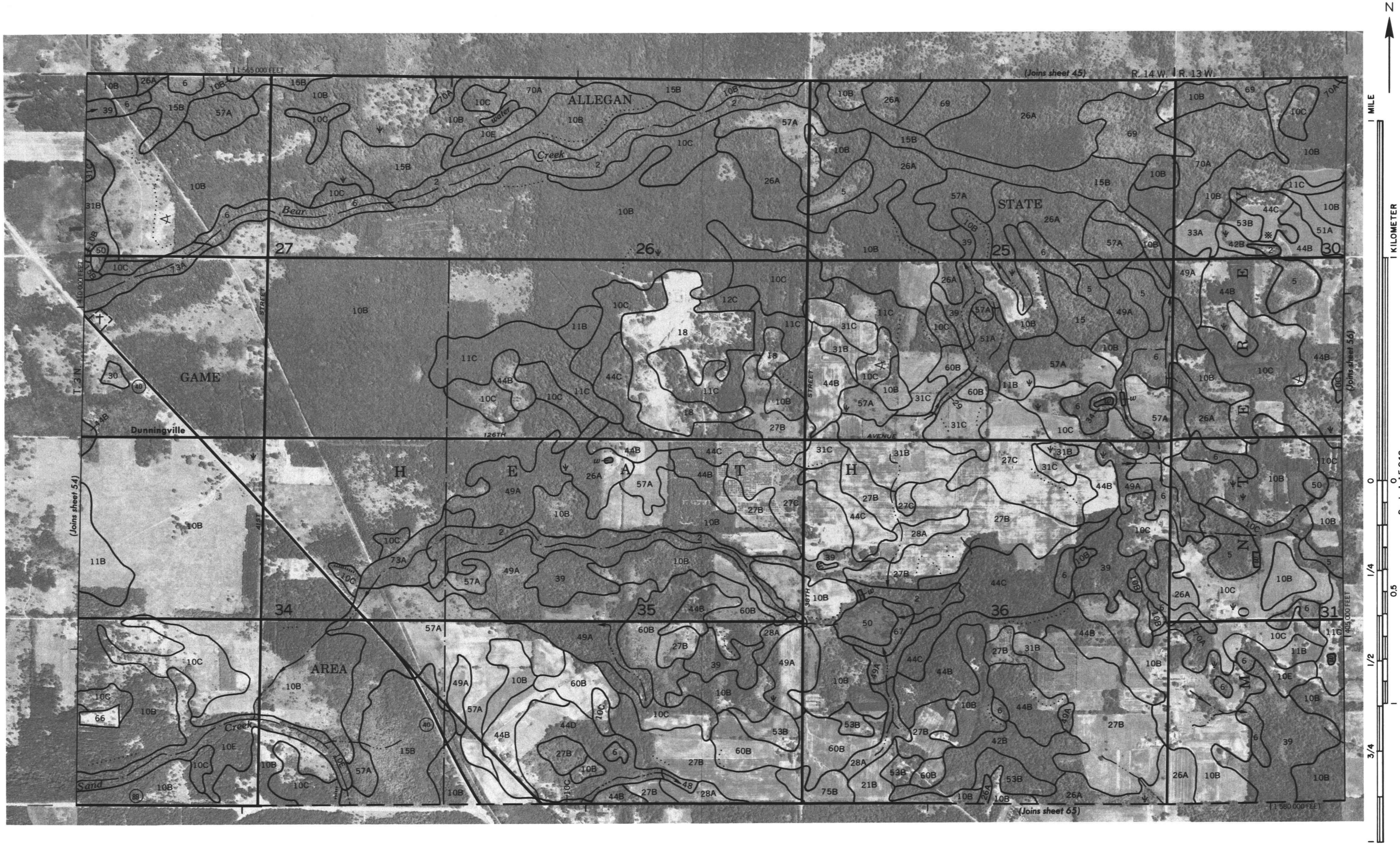
ALLEGAN COUNTY, MICHIGAN NO. 53

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 54



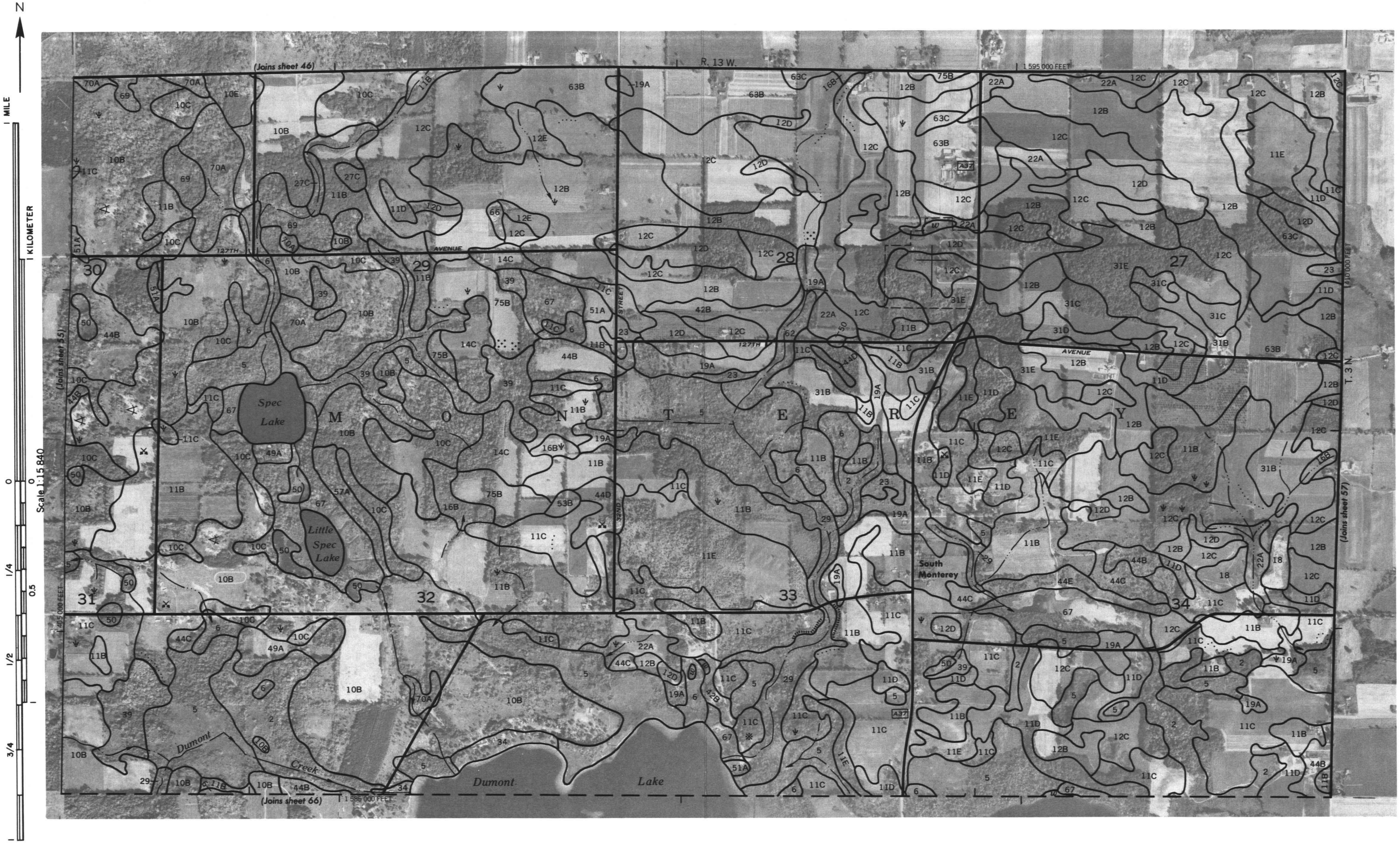
This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



ALLEGAN COUNTY, MICHIGAN NO. 55

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 56

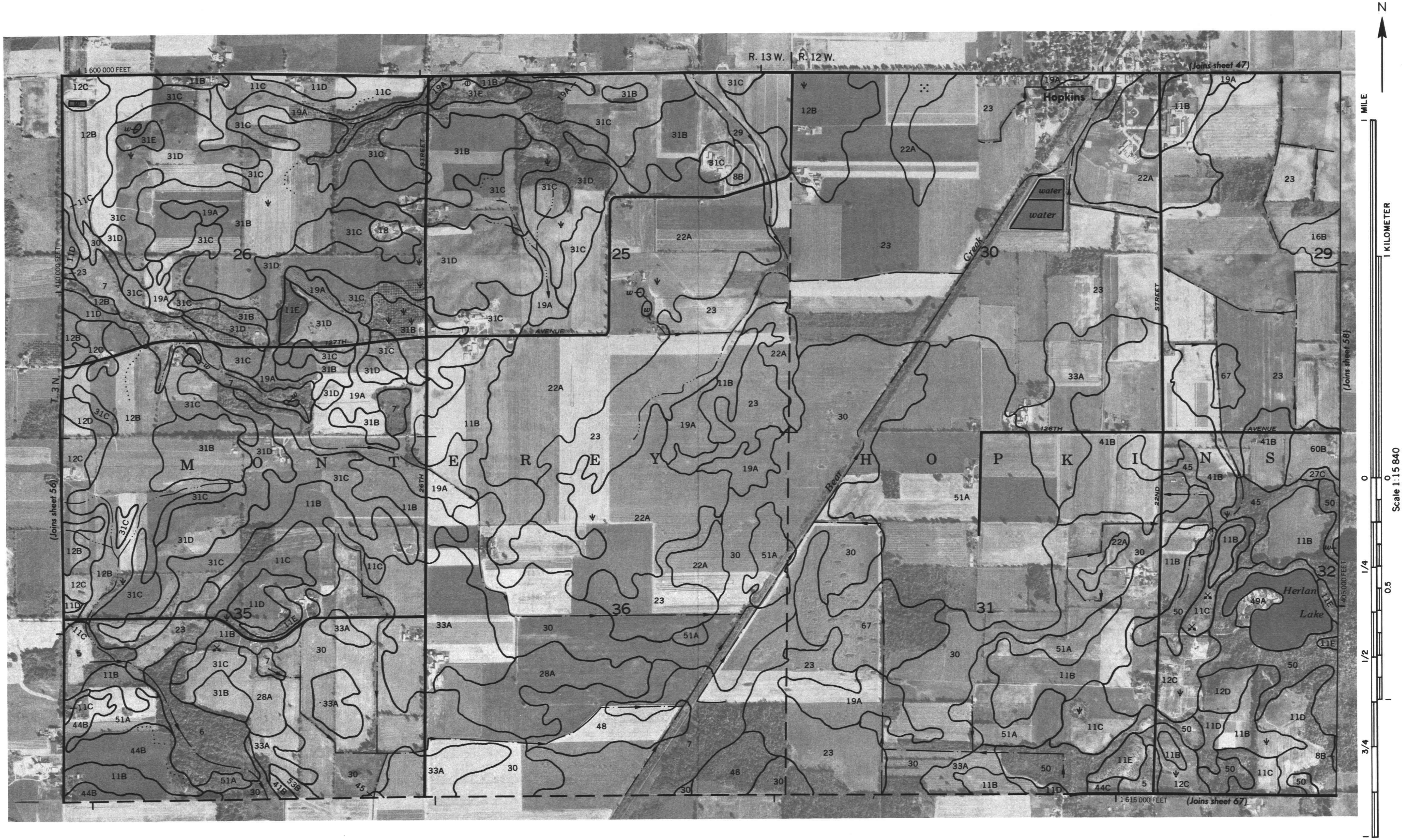


This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

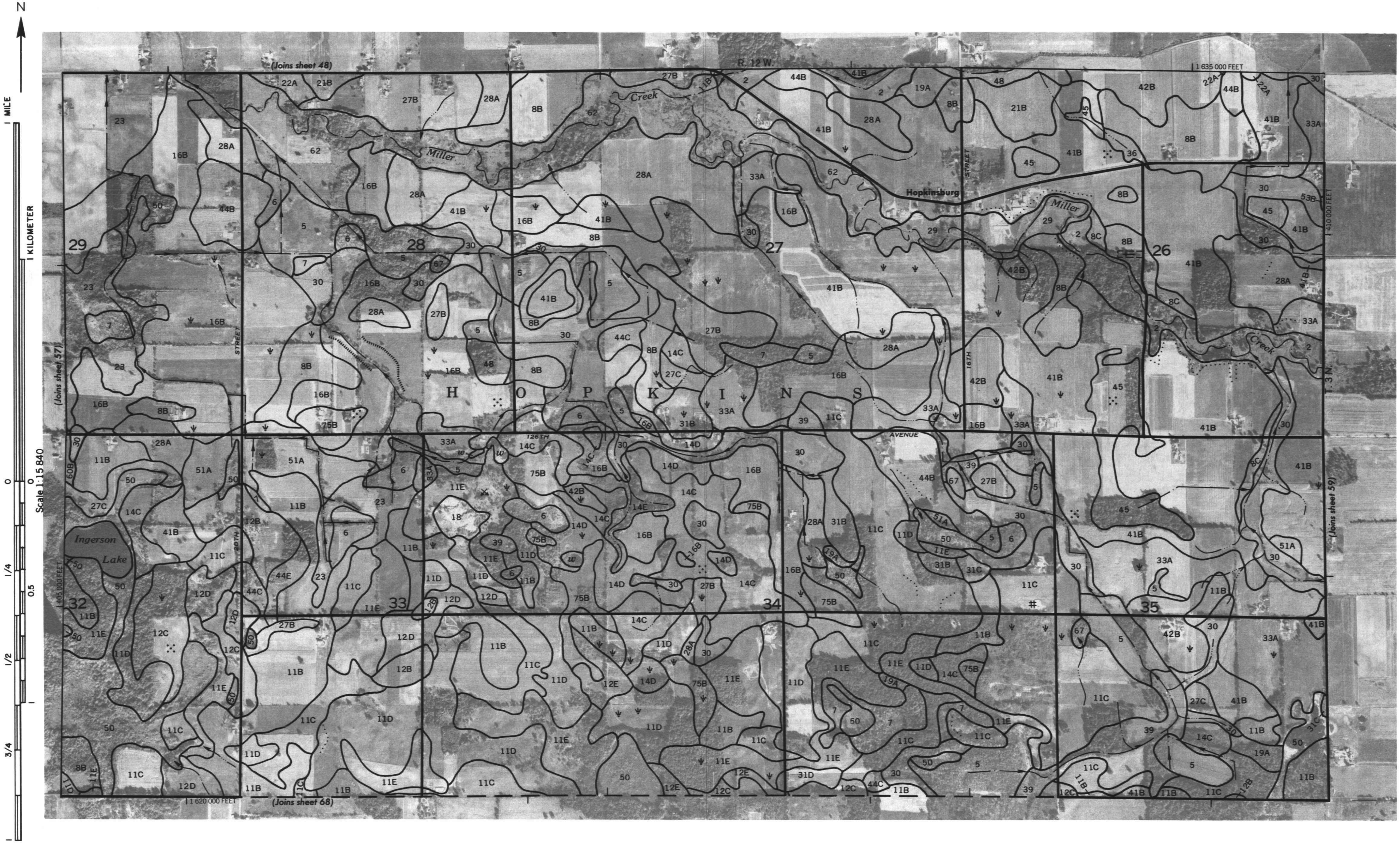
ALLEGAN COUNTY, MICHIGAN NO. 56

ALLEGAN COUNTY, MICHIGAN NO. 57

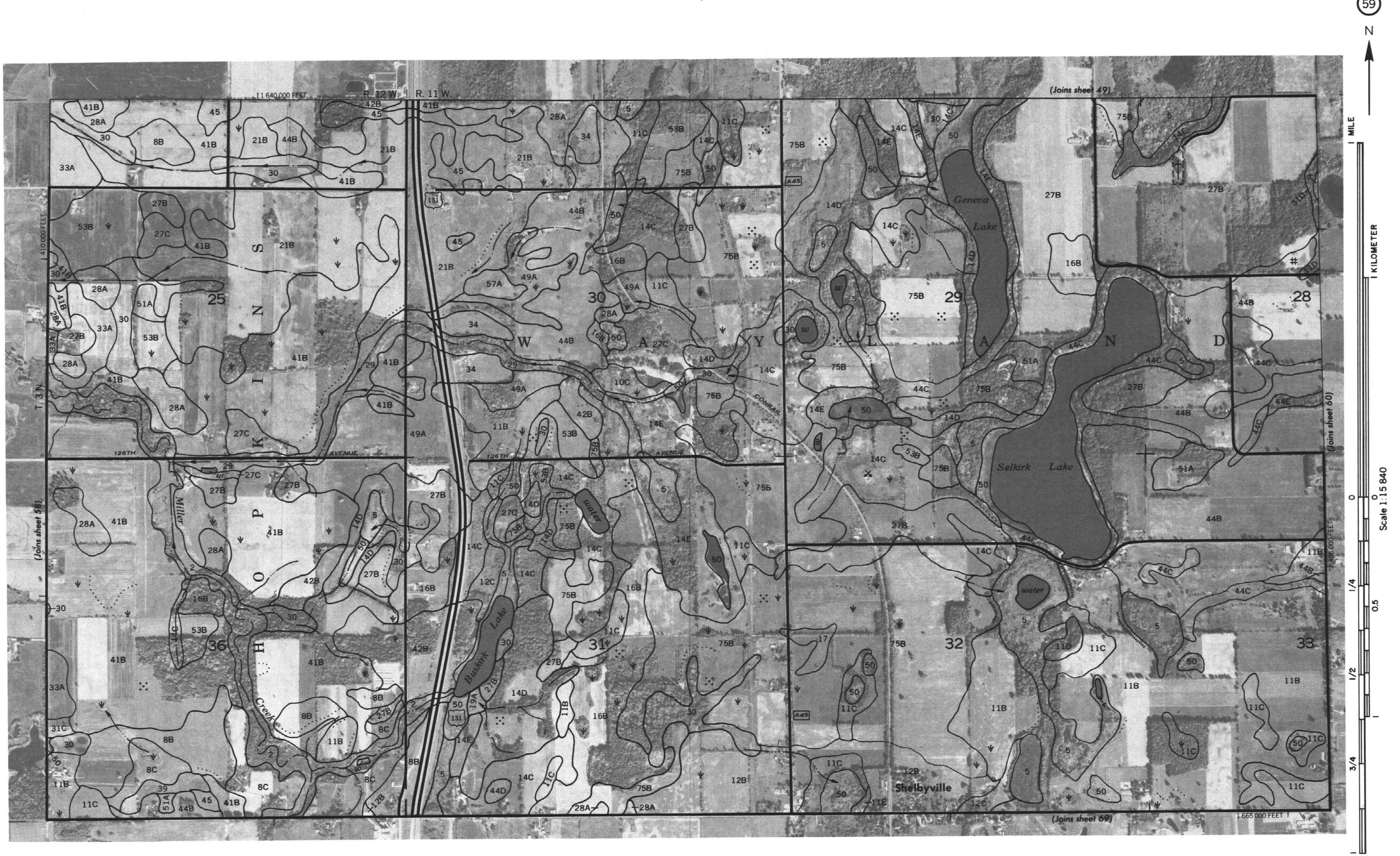
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 58



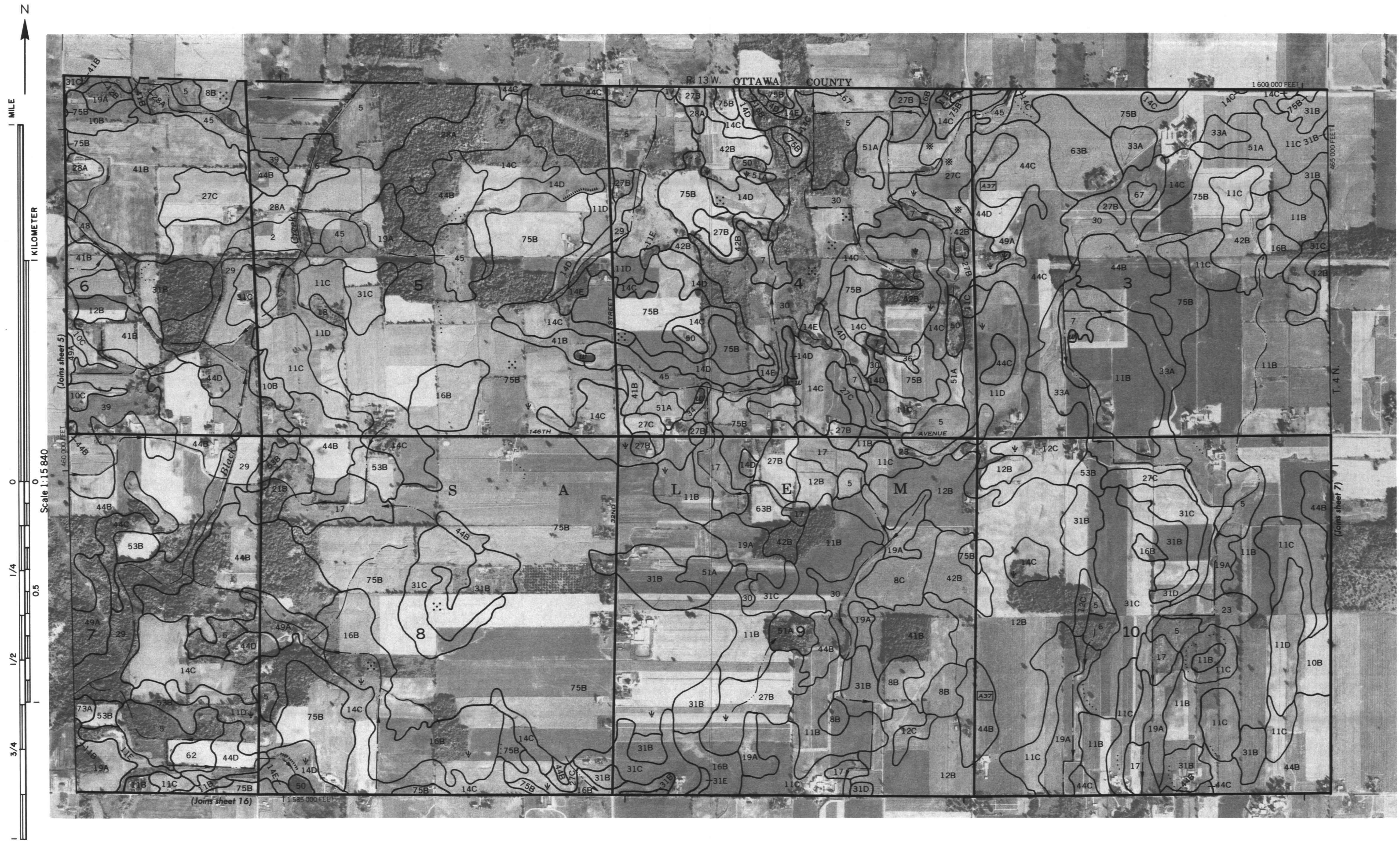
This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



ALLEGAN COUNTY, MICHIGAN NO. 59

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 6



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

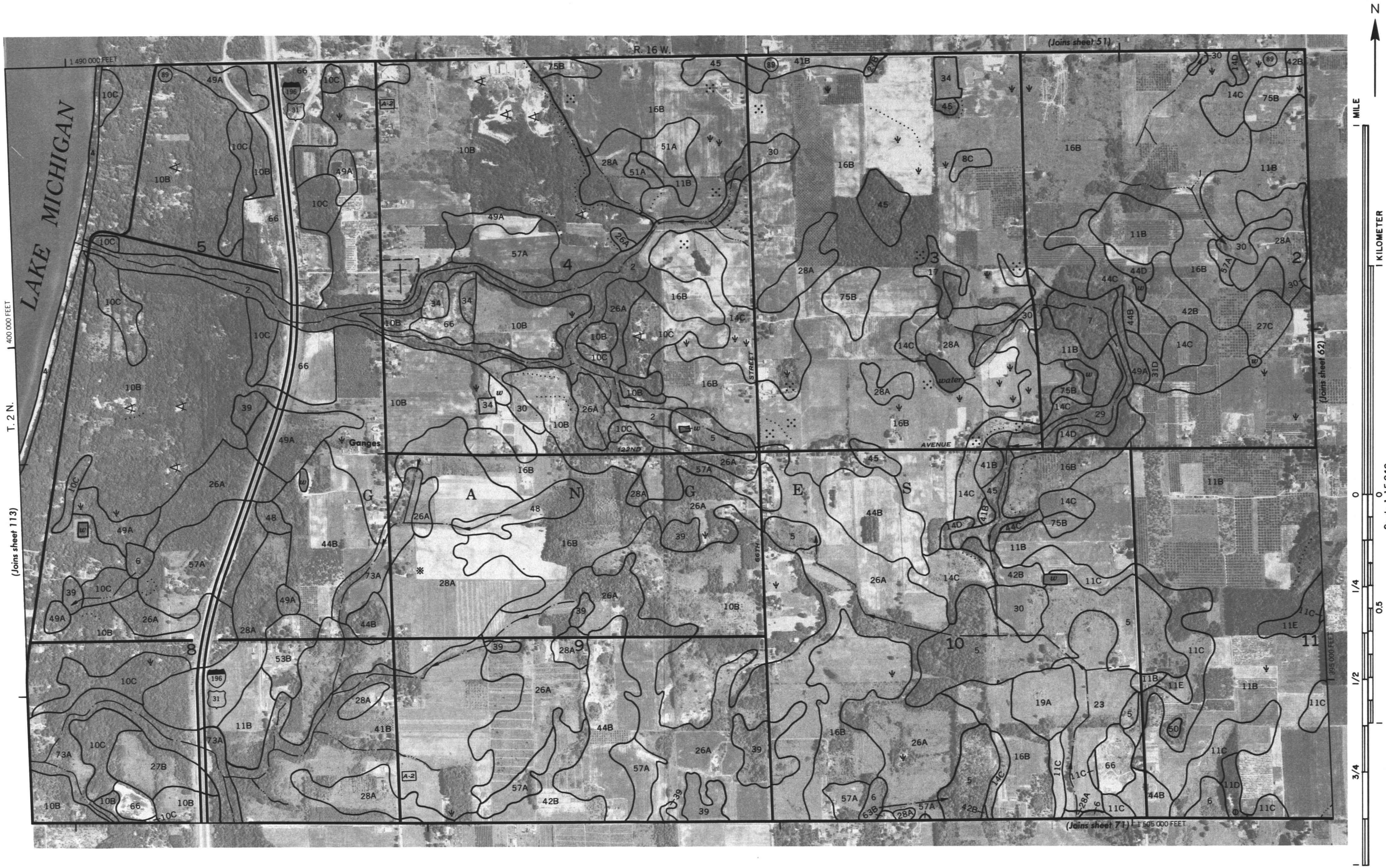
(60)

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 60

This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 60

61



ALLEGAN COUNTY, MICHIGAN NO. 61

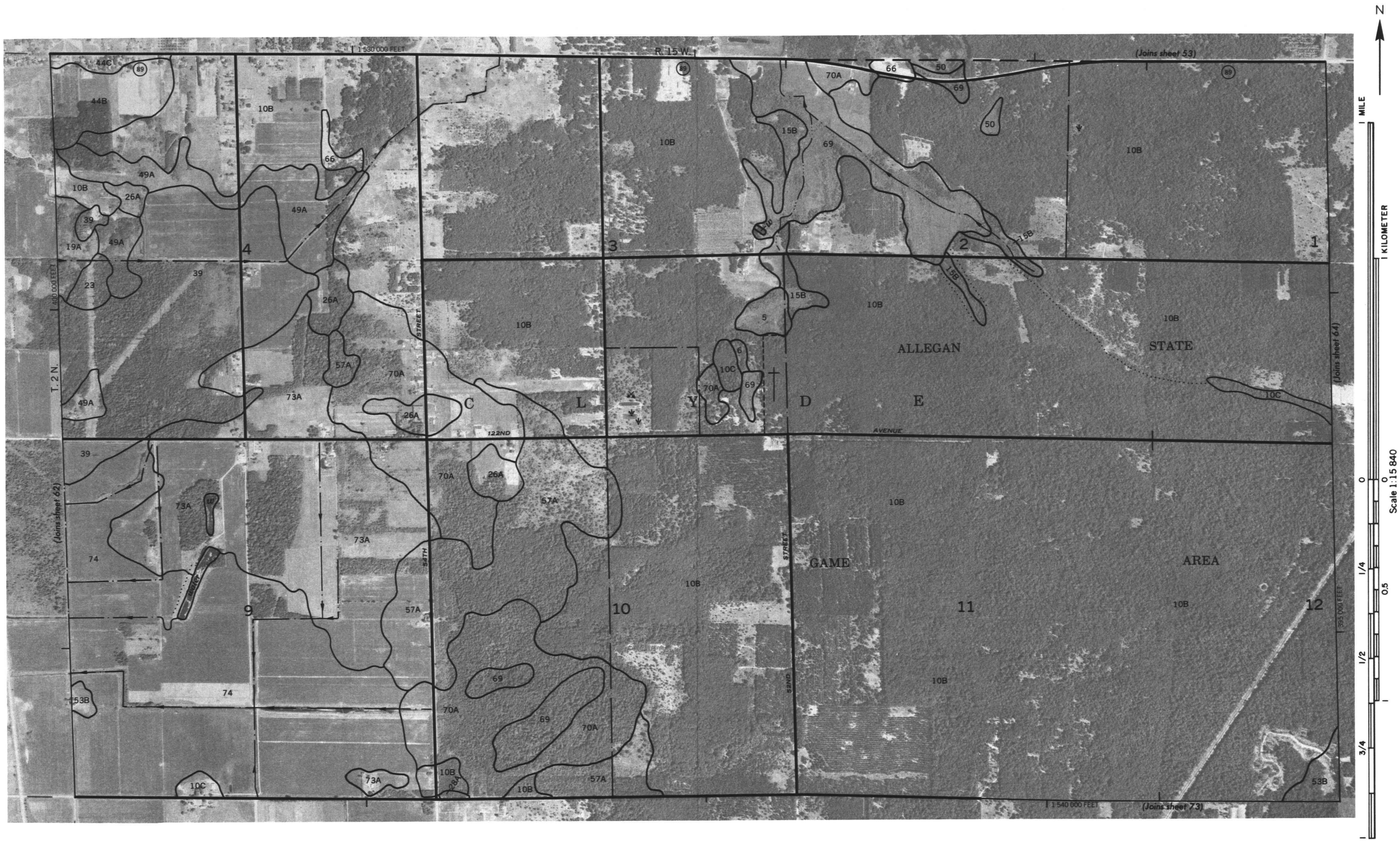
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 62

This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

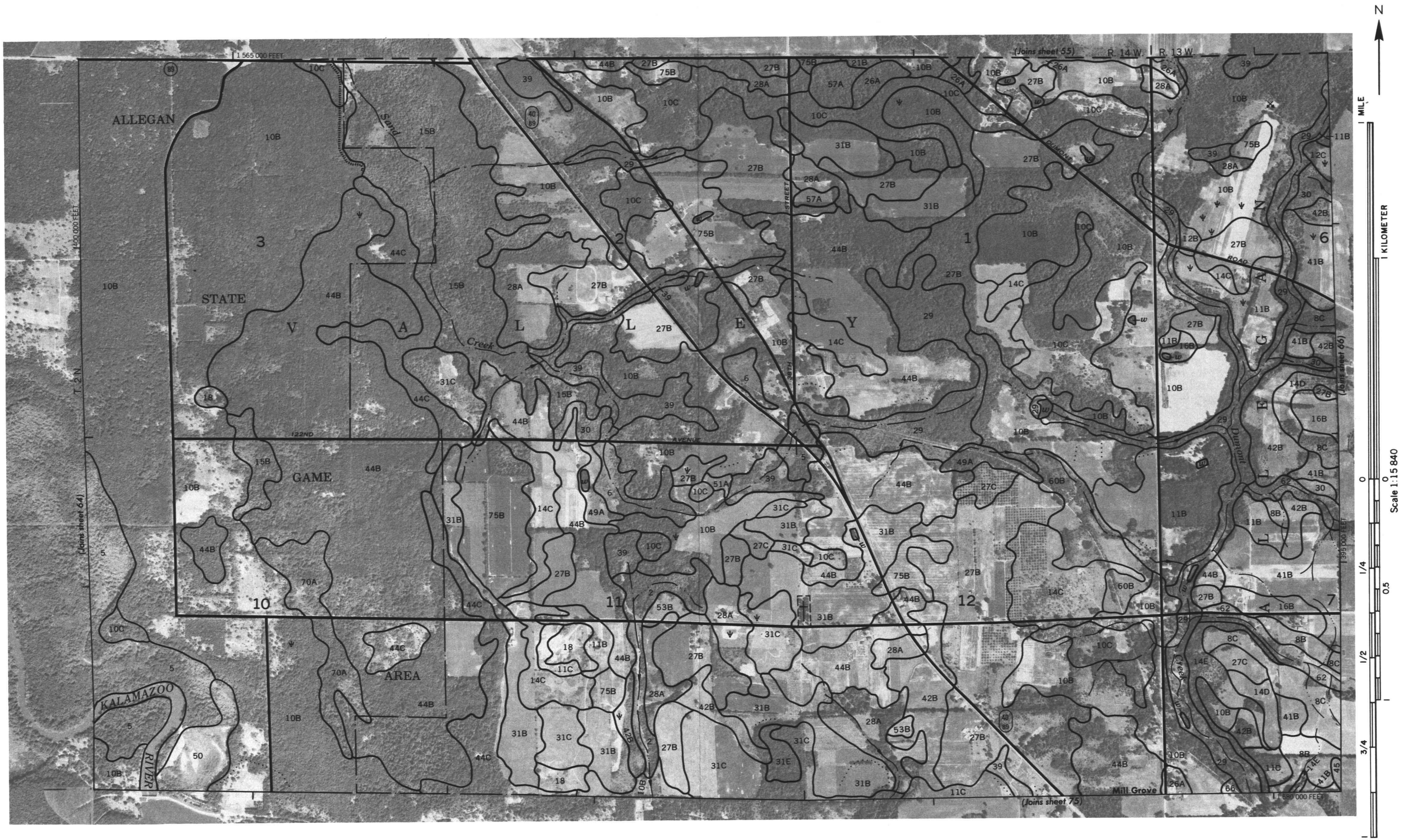
ALLEGAN COUNTY, MICHIGAN NO. 63

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 64

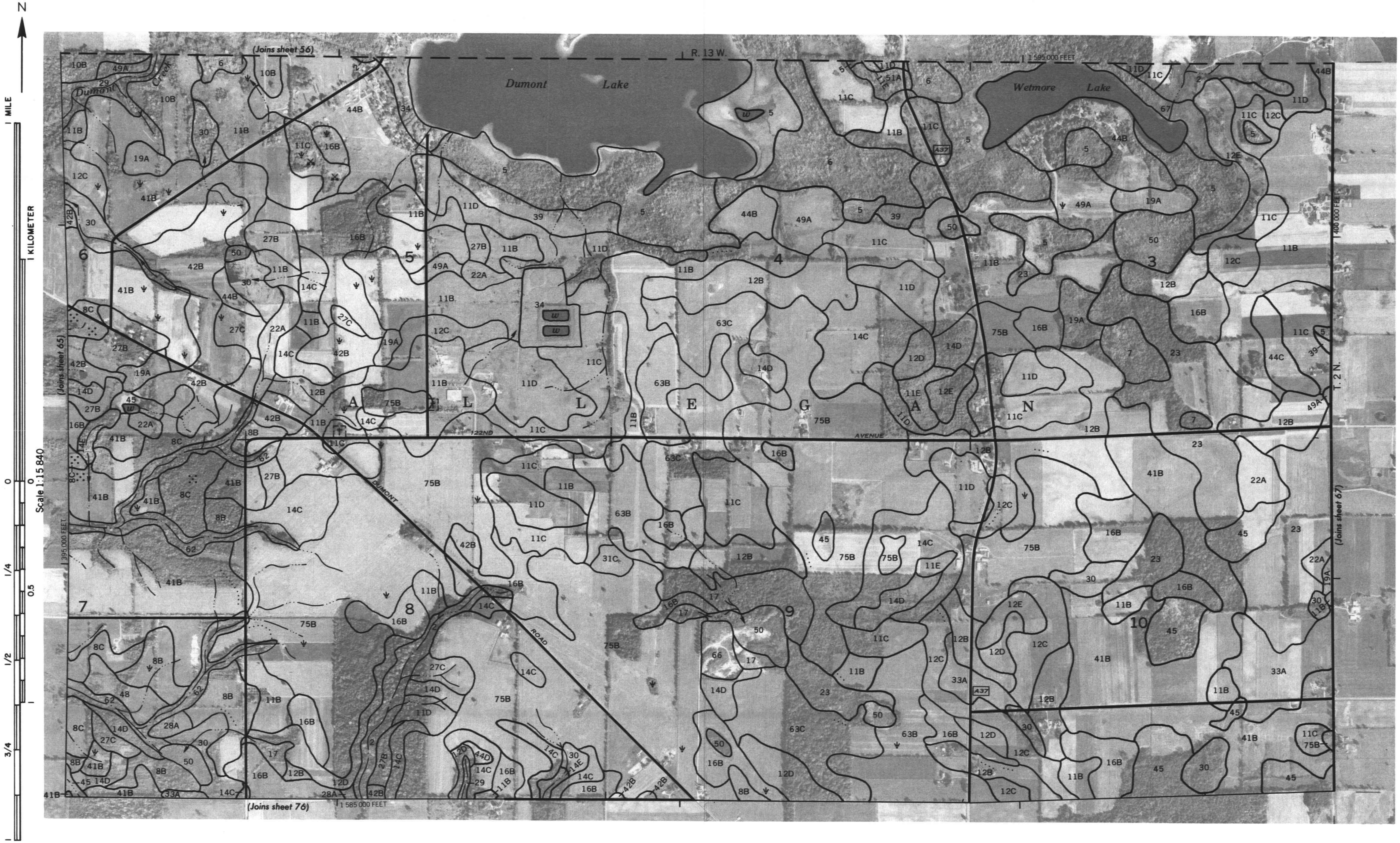
This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



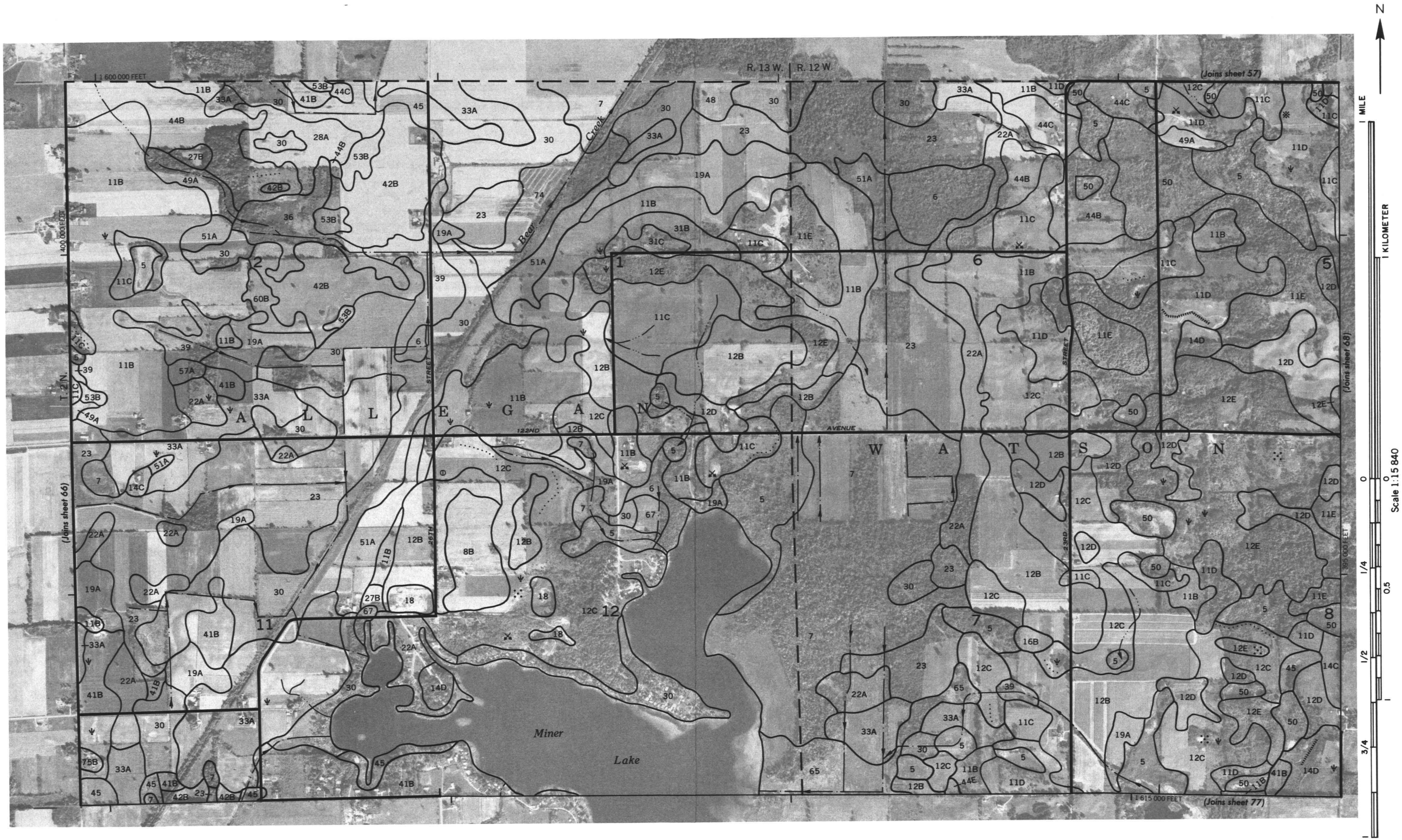
ALLEGAN COUNTY, MICHIGAN NO. 65

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 66



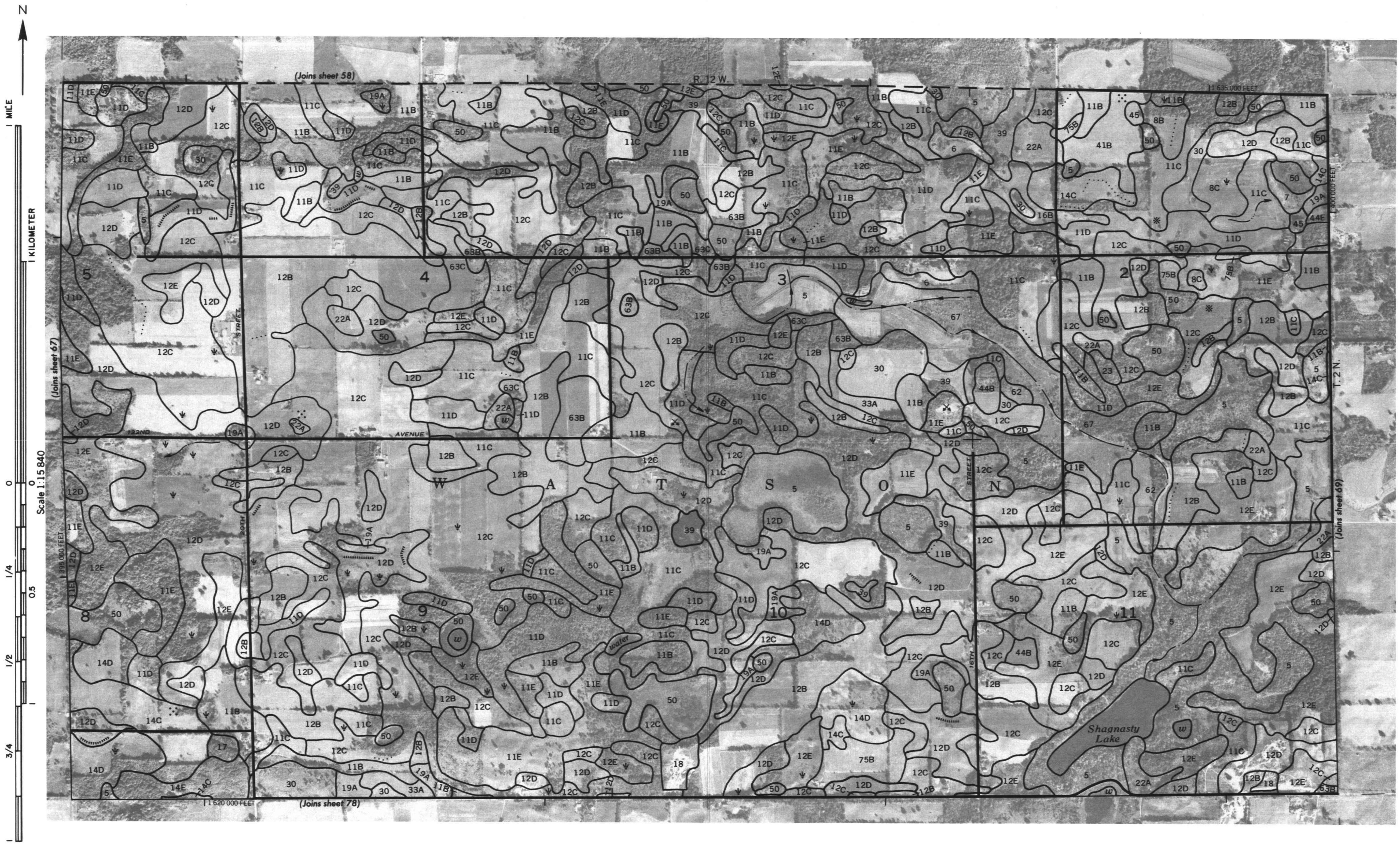
This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



ALLEGAN COUNTY, MICHIGAN NO. 67

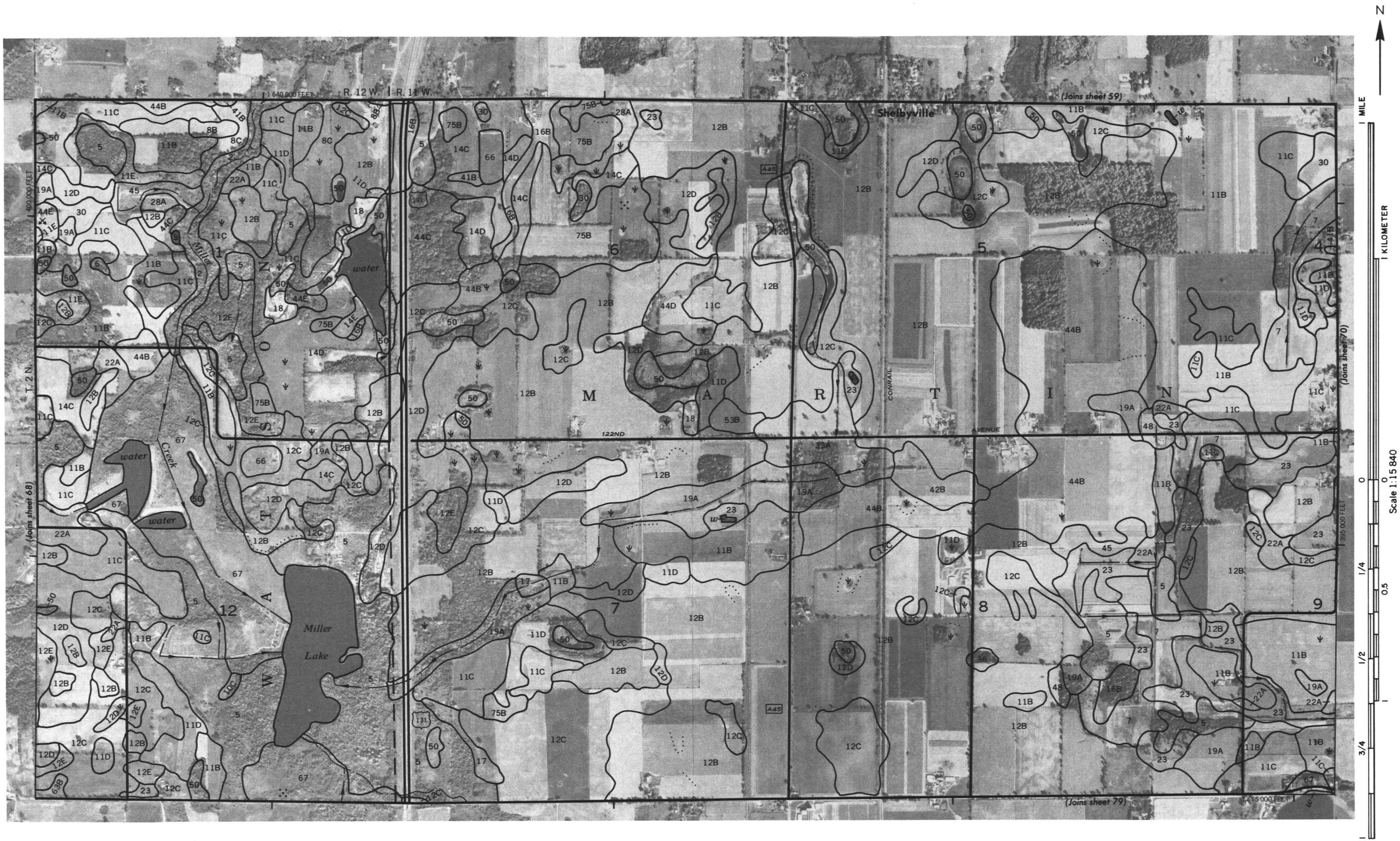
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 68



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

69

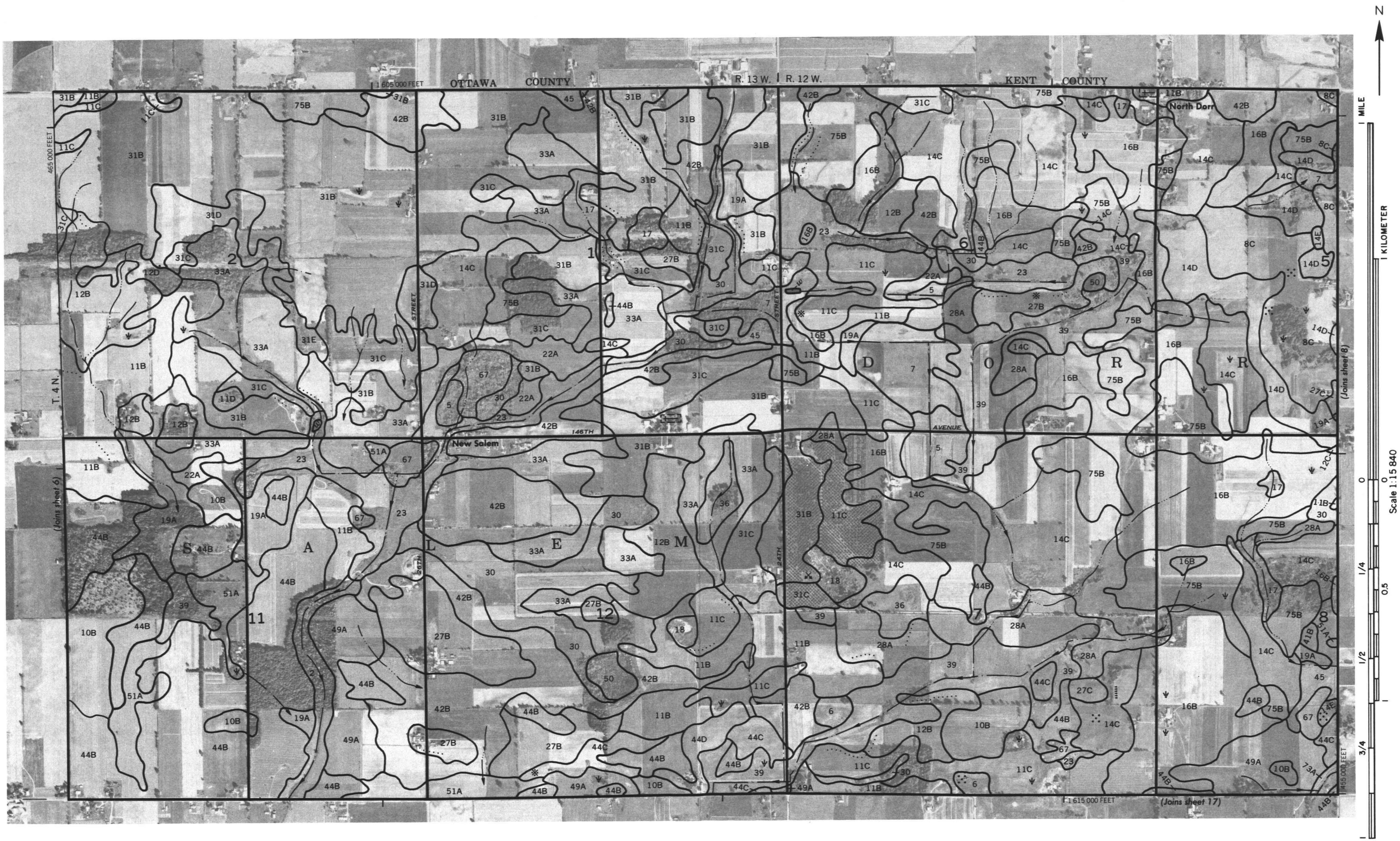


ALLEGAN COUNTY, MICHIGAN NO. 69

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 7

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 70

This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

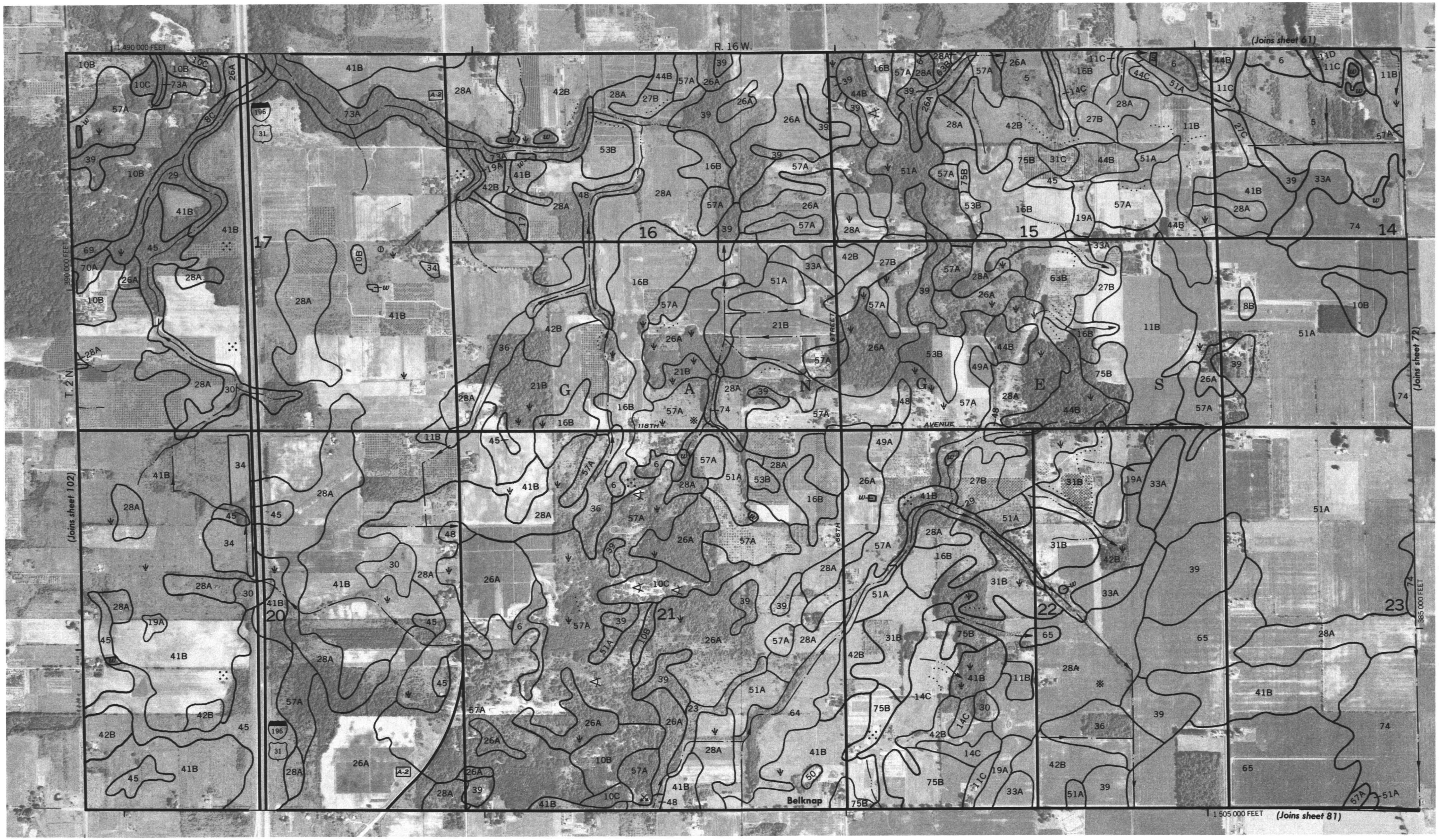
ALLEGAN COUNTY, MICHIGAN NO. 70

71

N

ALLEGAN COUNTY, MICHIGAN NO. 71

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 MILE

1 KILOMETER

0 1/4 1/2 3/4

0 0.5

Scale 1:15 840

72

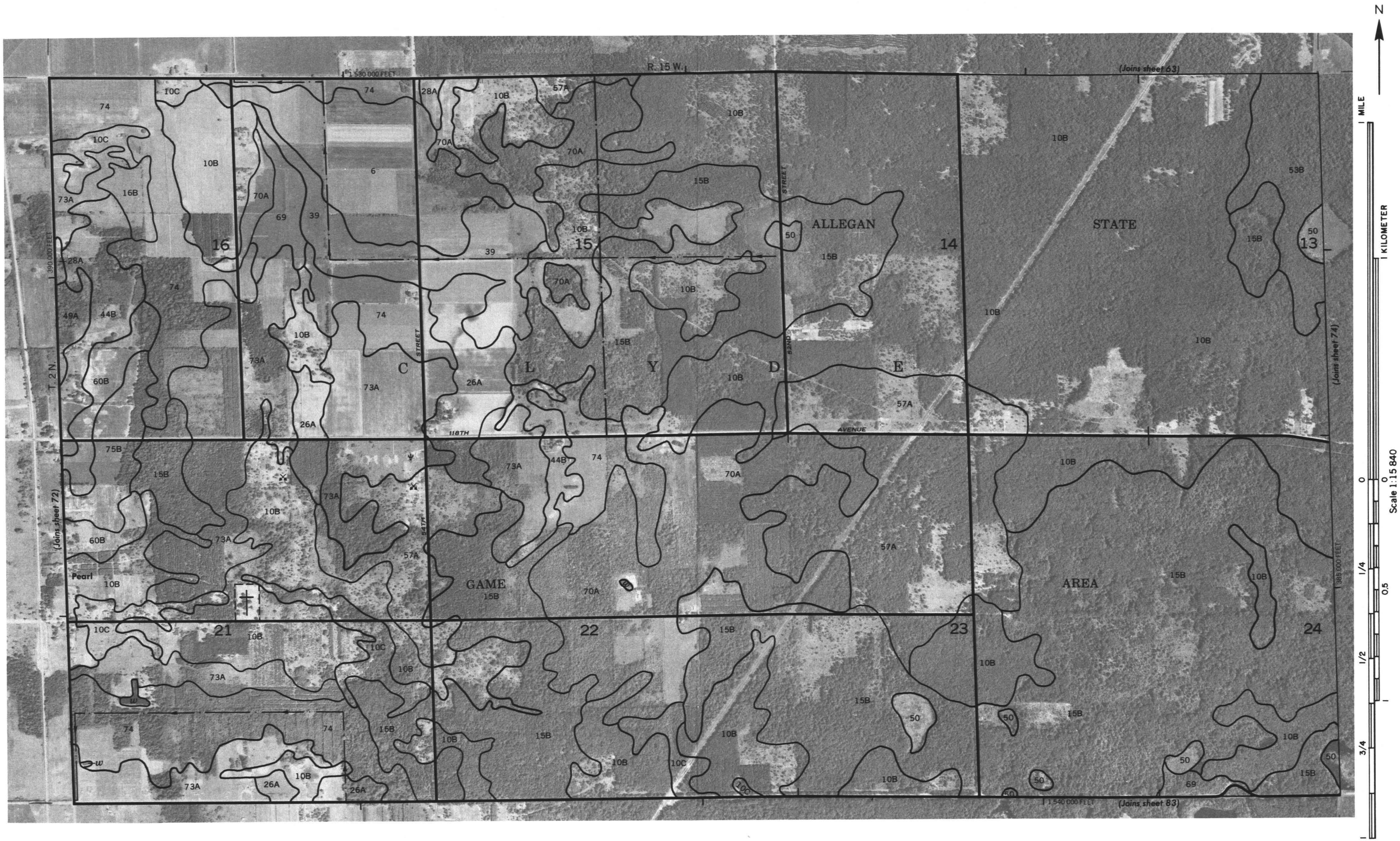
SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 72

This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 72

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 73

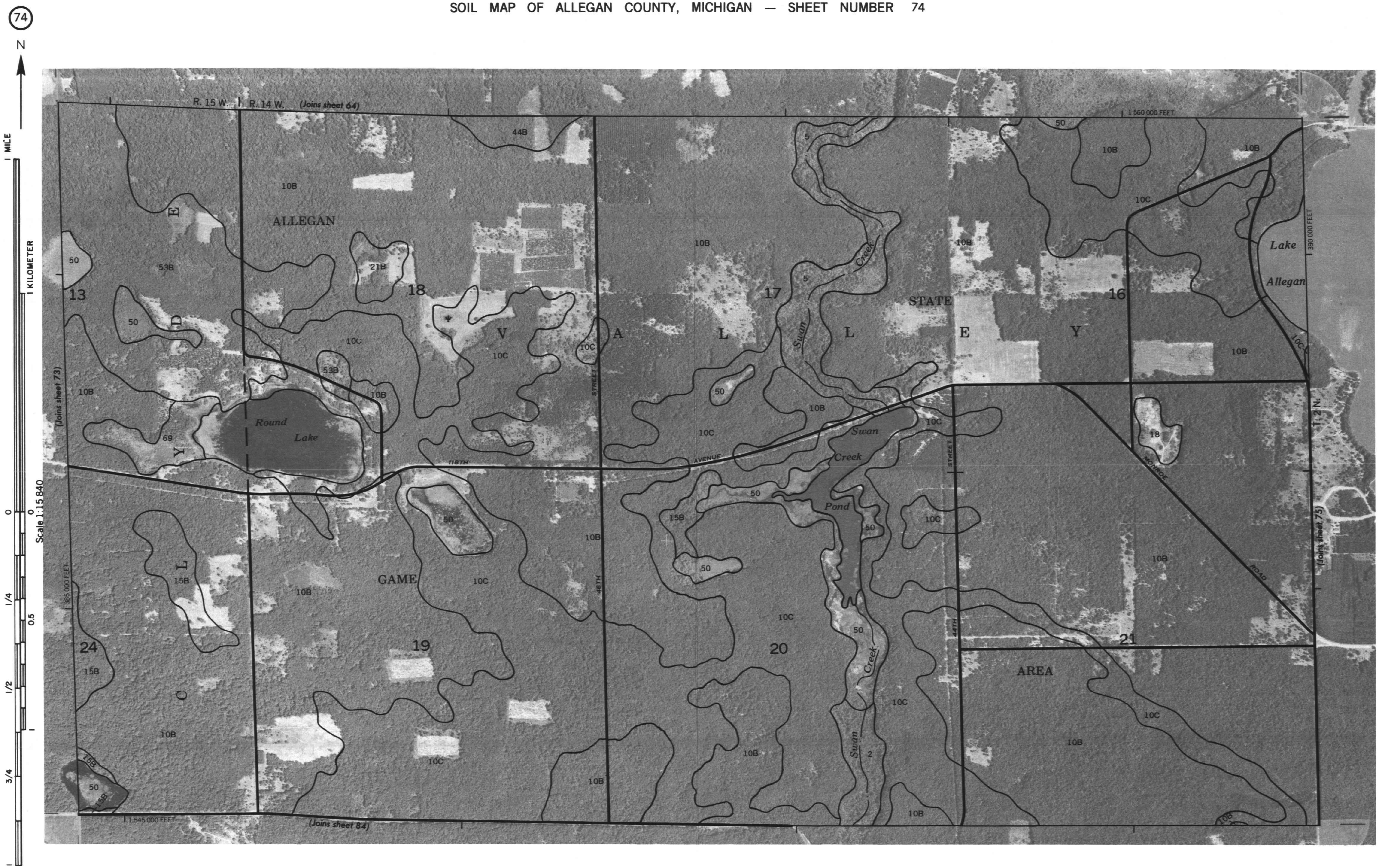
73



ALLEGAN COUNTY, MICHIGAN NO. 73

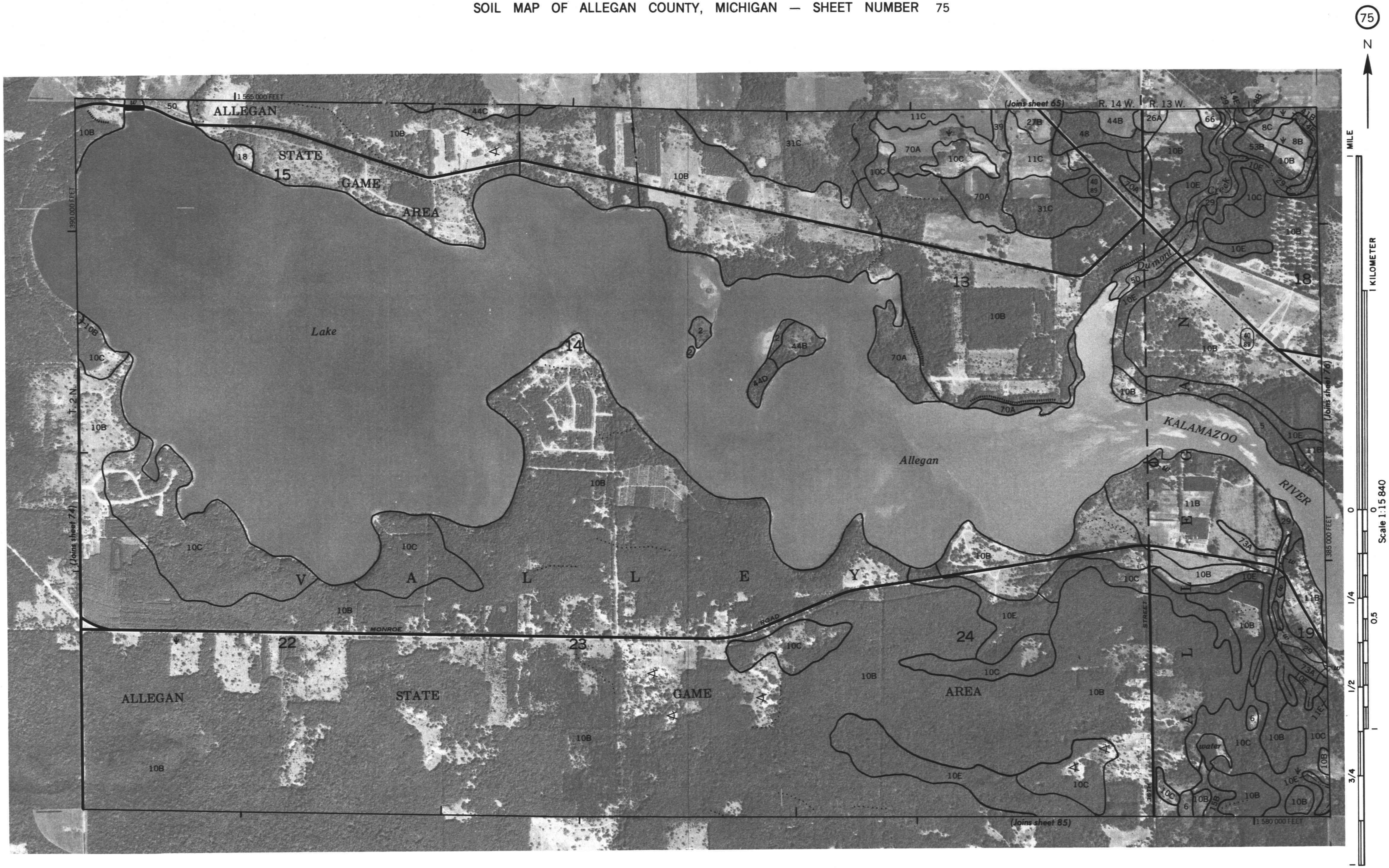
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 74



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

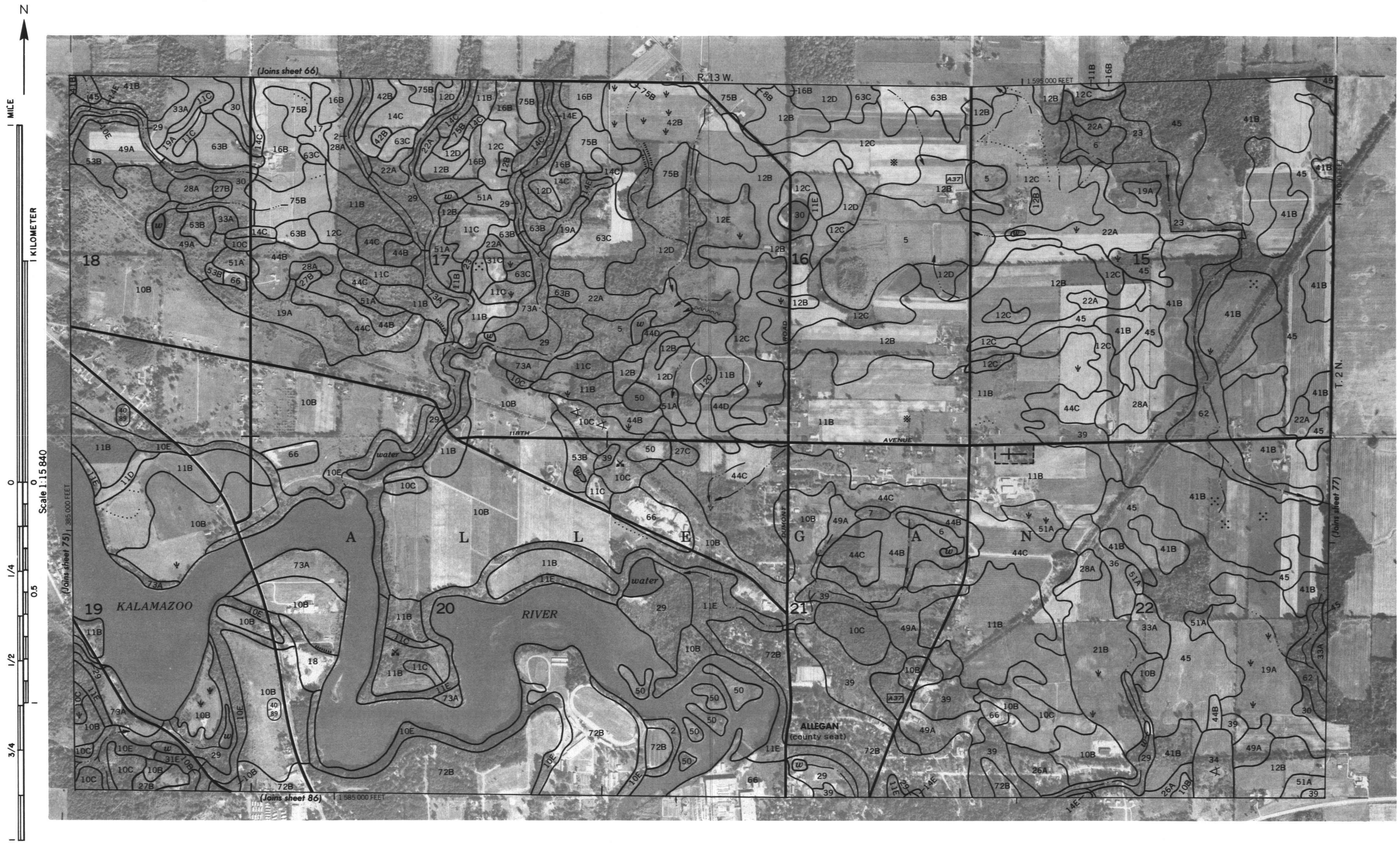
ALLEGAN COUNTY, MICHIGAN NO. 74



ALLEGAN COUNTY, MICHIGAN NO. 75

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 76



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

77

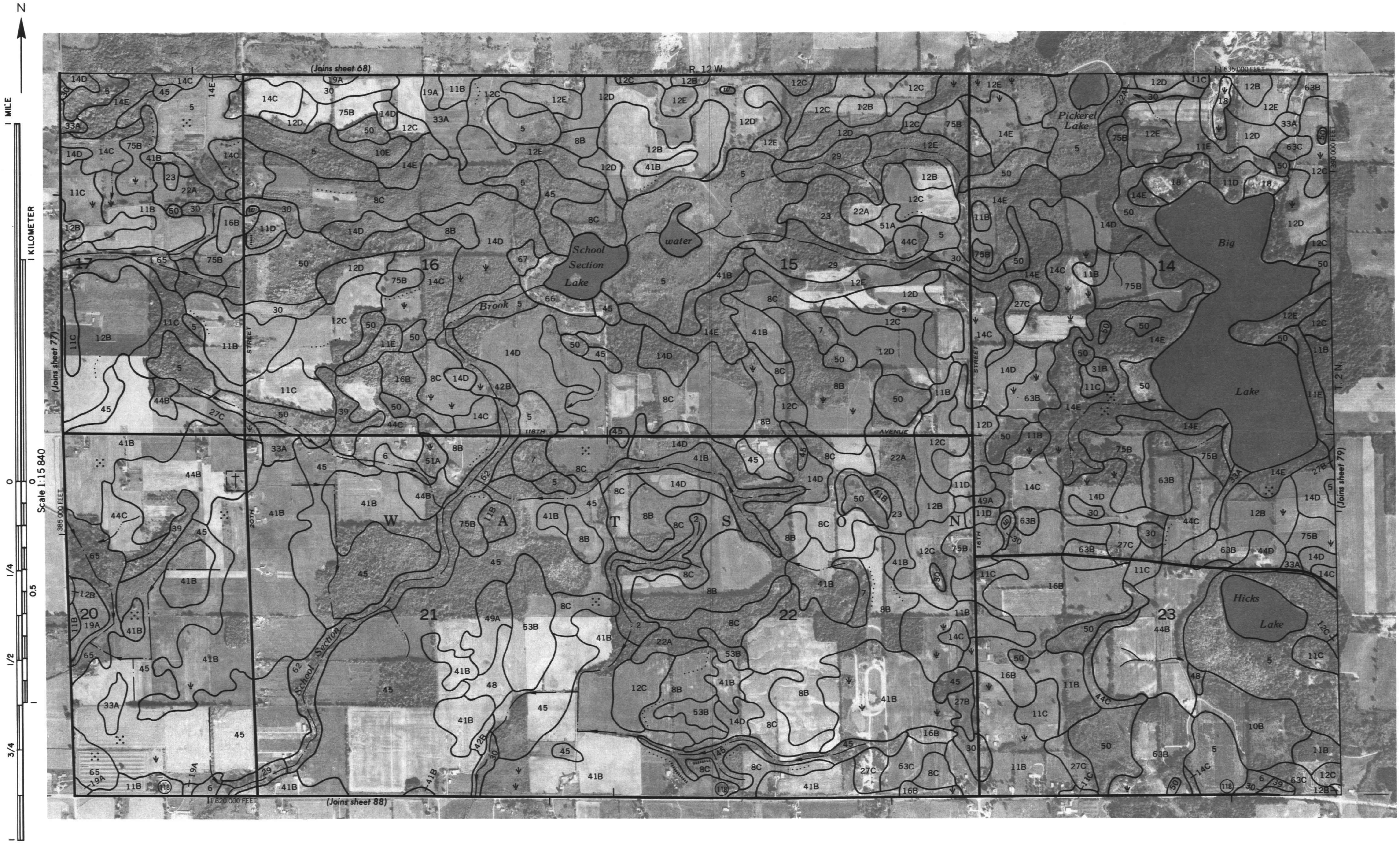
N

ALLEGAN COUNTY, MICHIGAN NO. 77

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 MILE
1 KILOMETER
Scale 1:15 840
0 1/4 1/2 3/4 1
0 0.5 1

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 78



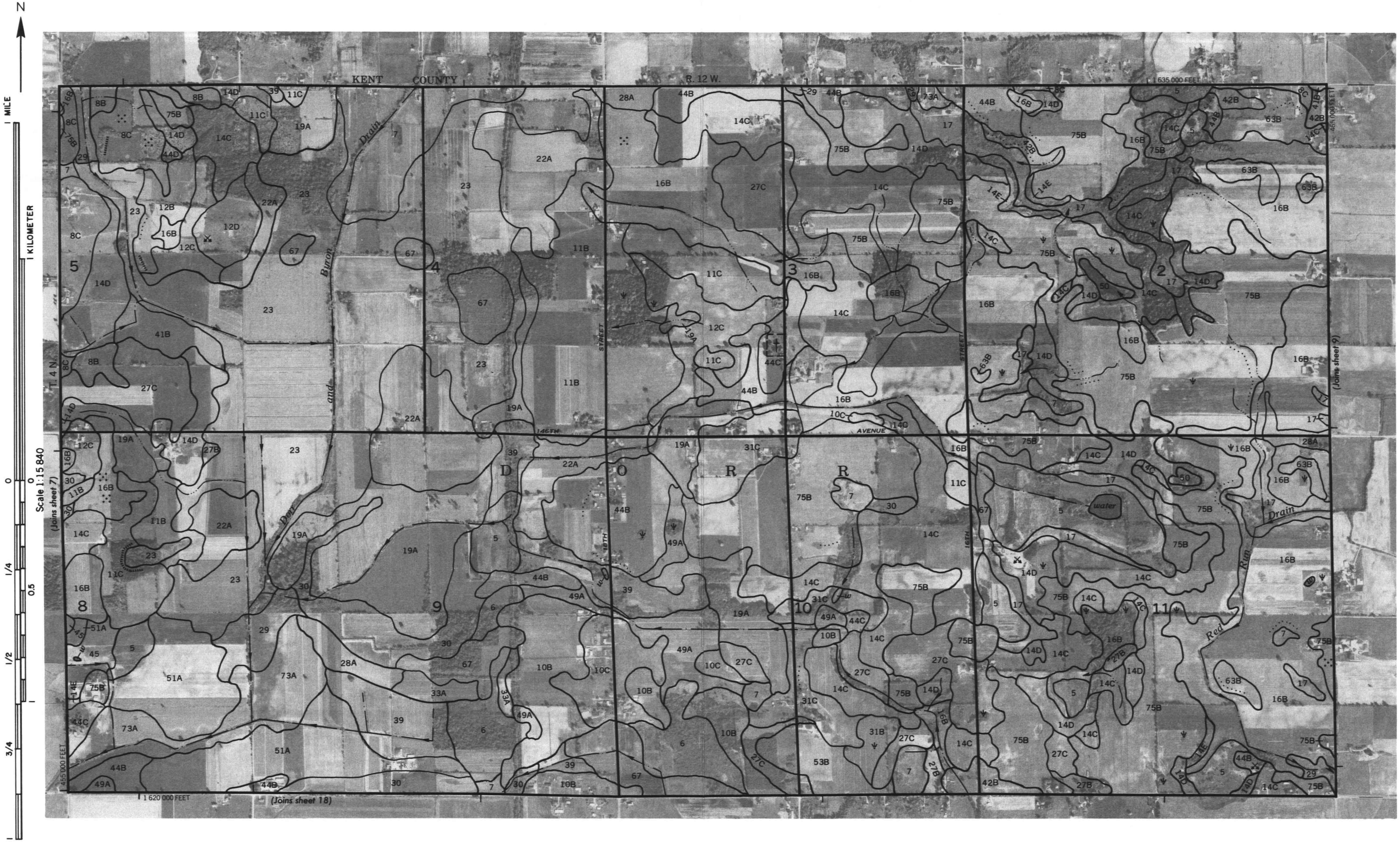
This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 78

ALLEGAN COUNTY, MICHIGAN NO. 79

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

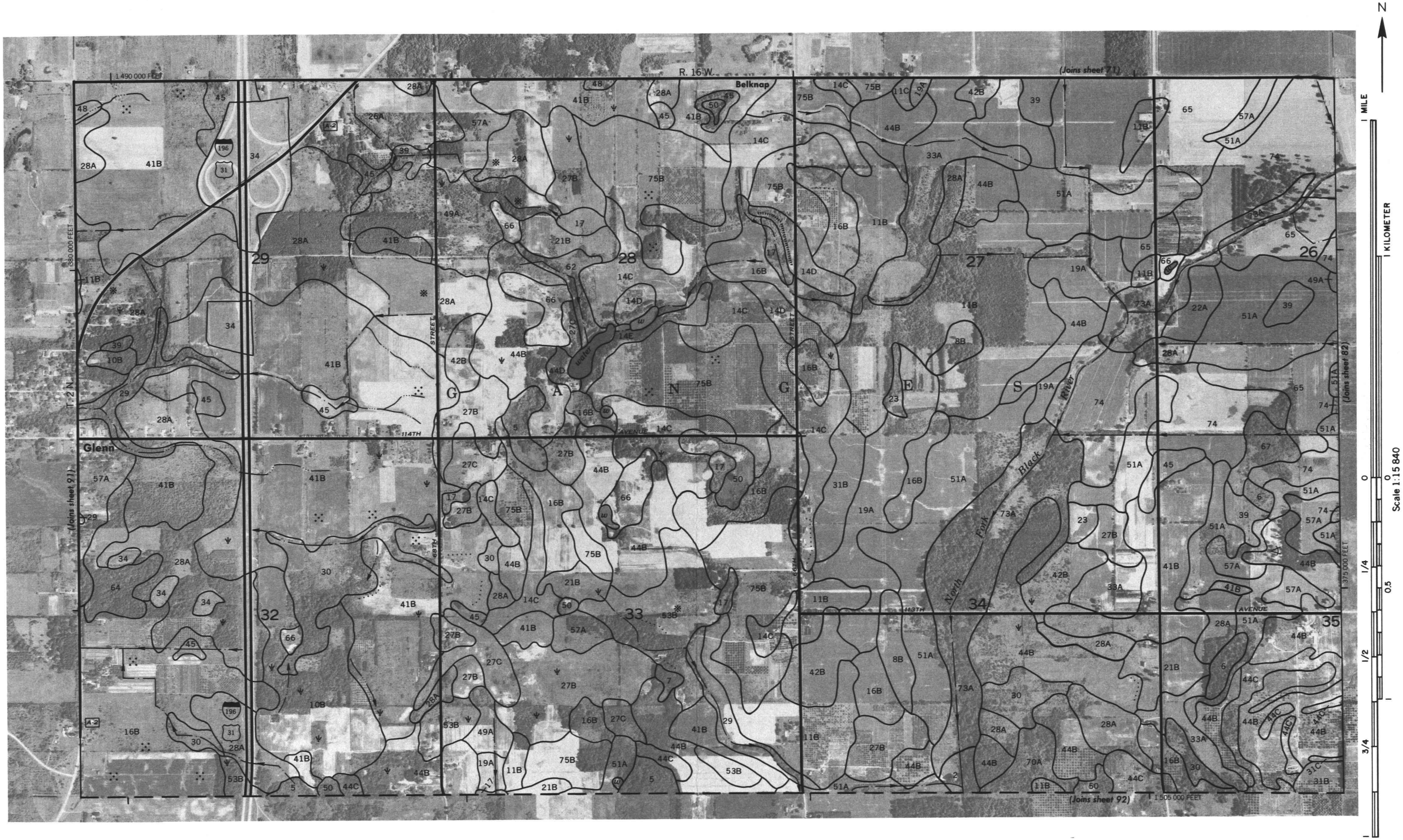
SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 8



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 8

This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 82

This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 83

83

N

MILE 0 1/4 1/2 3/4 1

KILOMETER 0 0.5 1

Scale 1:15 840

ALLEGAN COUNTY, MICHIGAN NO. 83

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

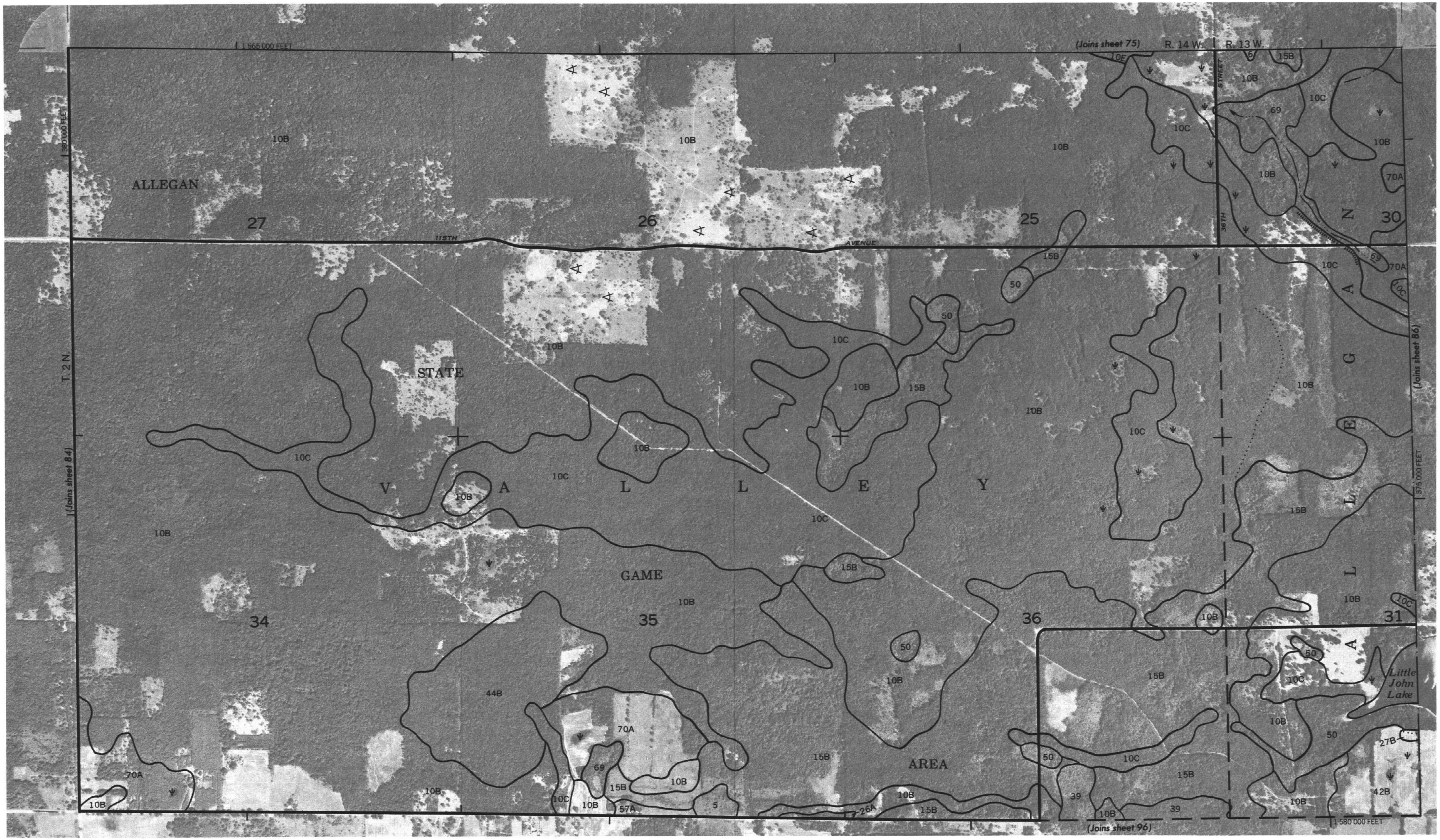
SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 84

This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 84

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 85

85



N

1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 1

0 0.5 1

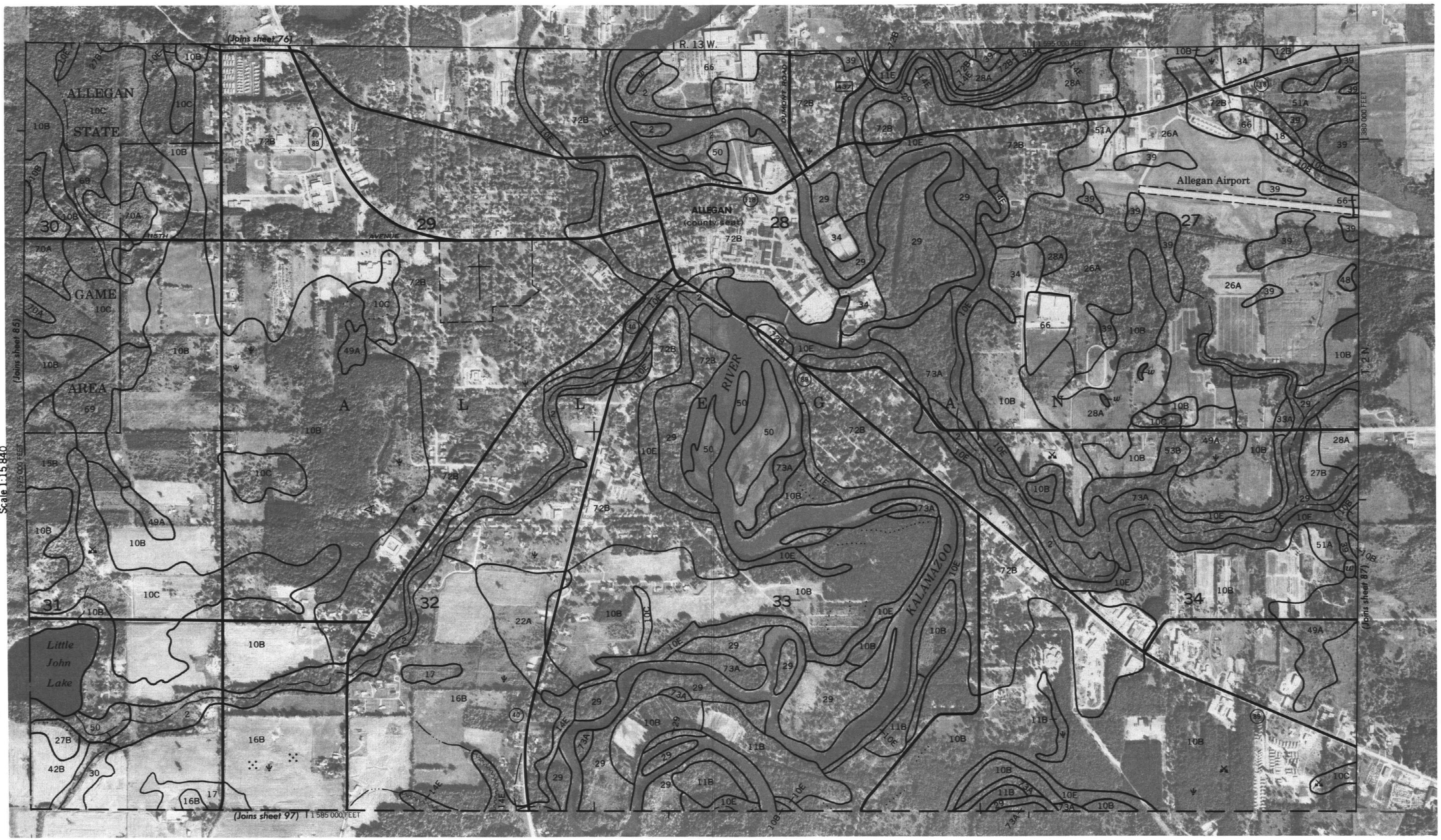
ALLEGAN COUNTY, MICHIGAN NO. 85

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 86

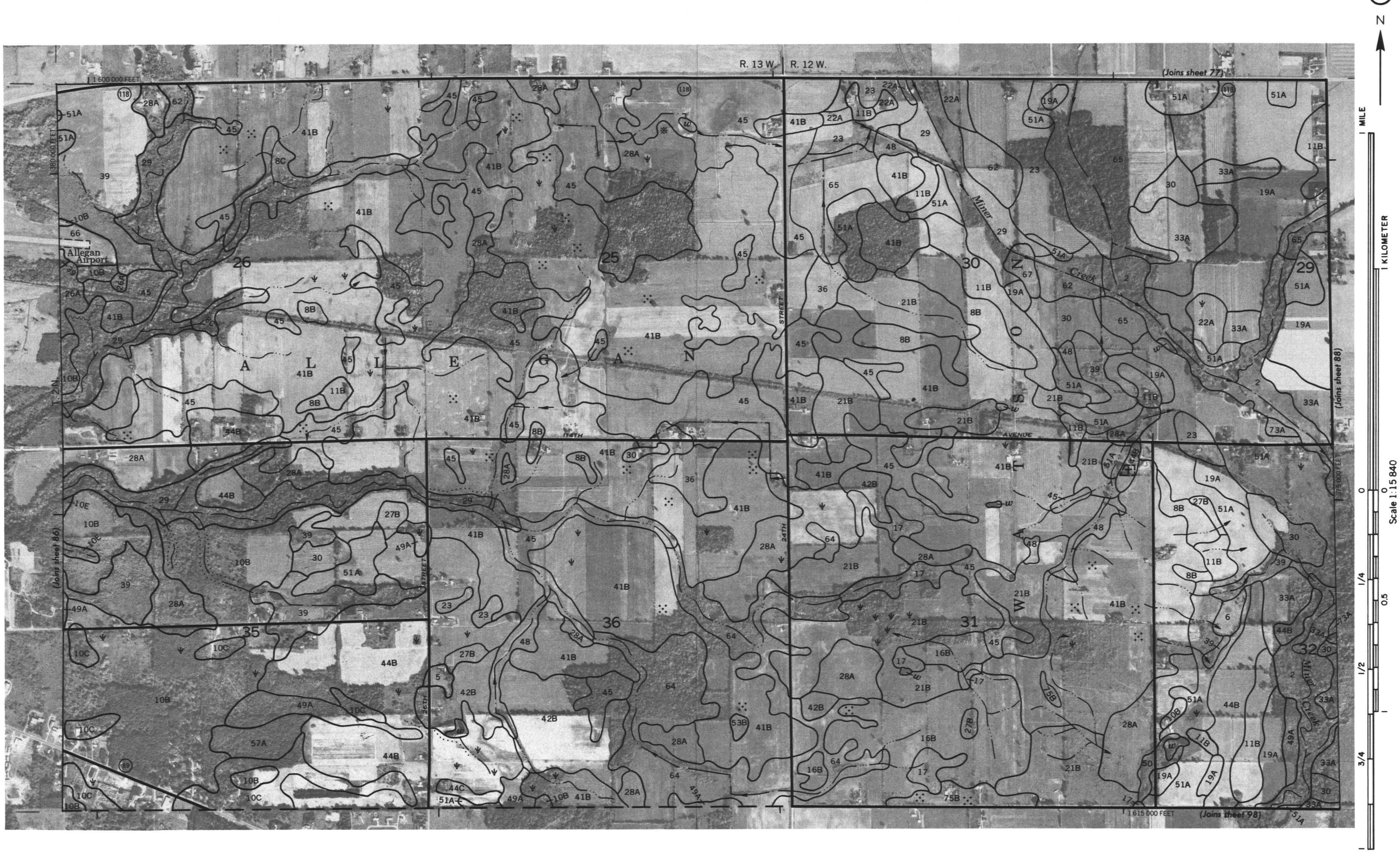
N

1 MILE
1 KILOMETER
Scale 1:15 840



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

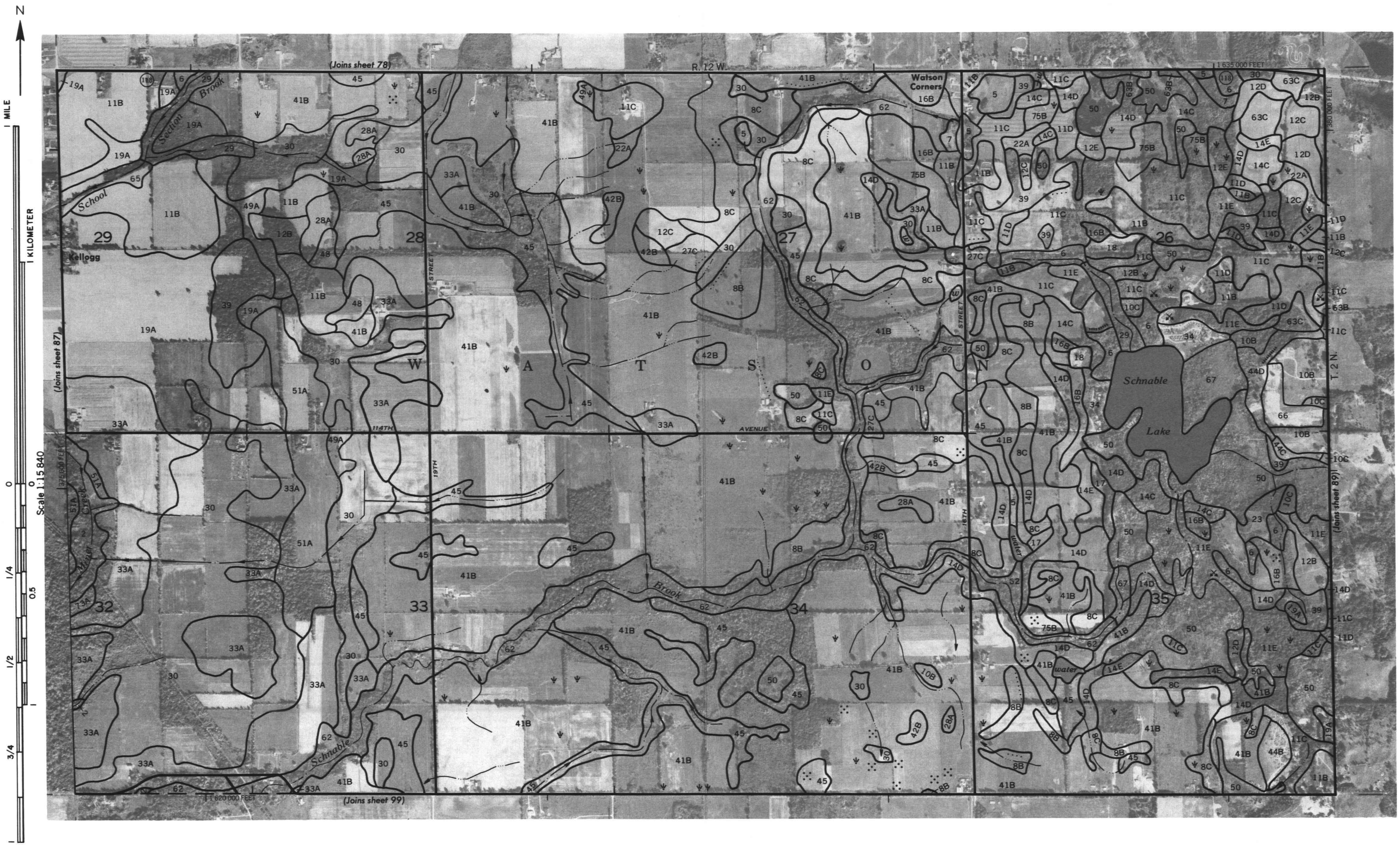
ALLEGAN COUNTY, MICHIGAN NO. 86



ALLEGAN COUNTY, MICHIGAN NO. 87

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

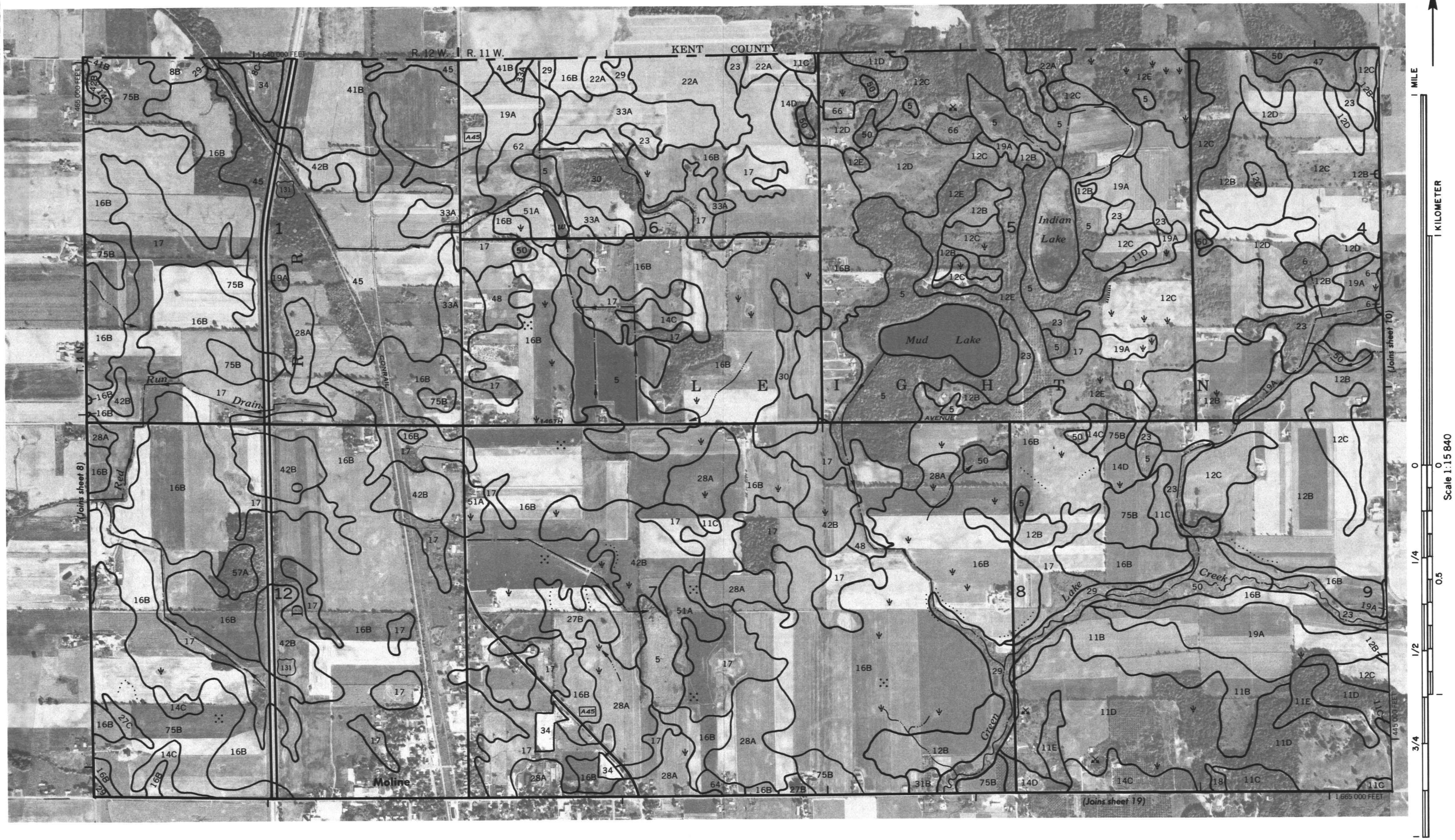
SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 88



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 89

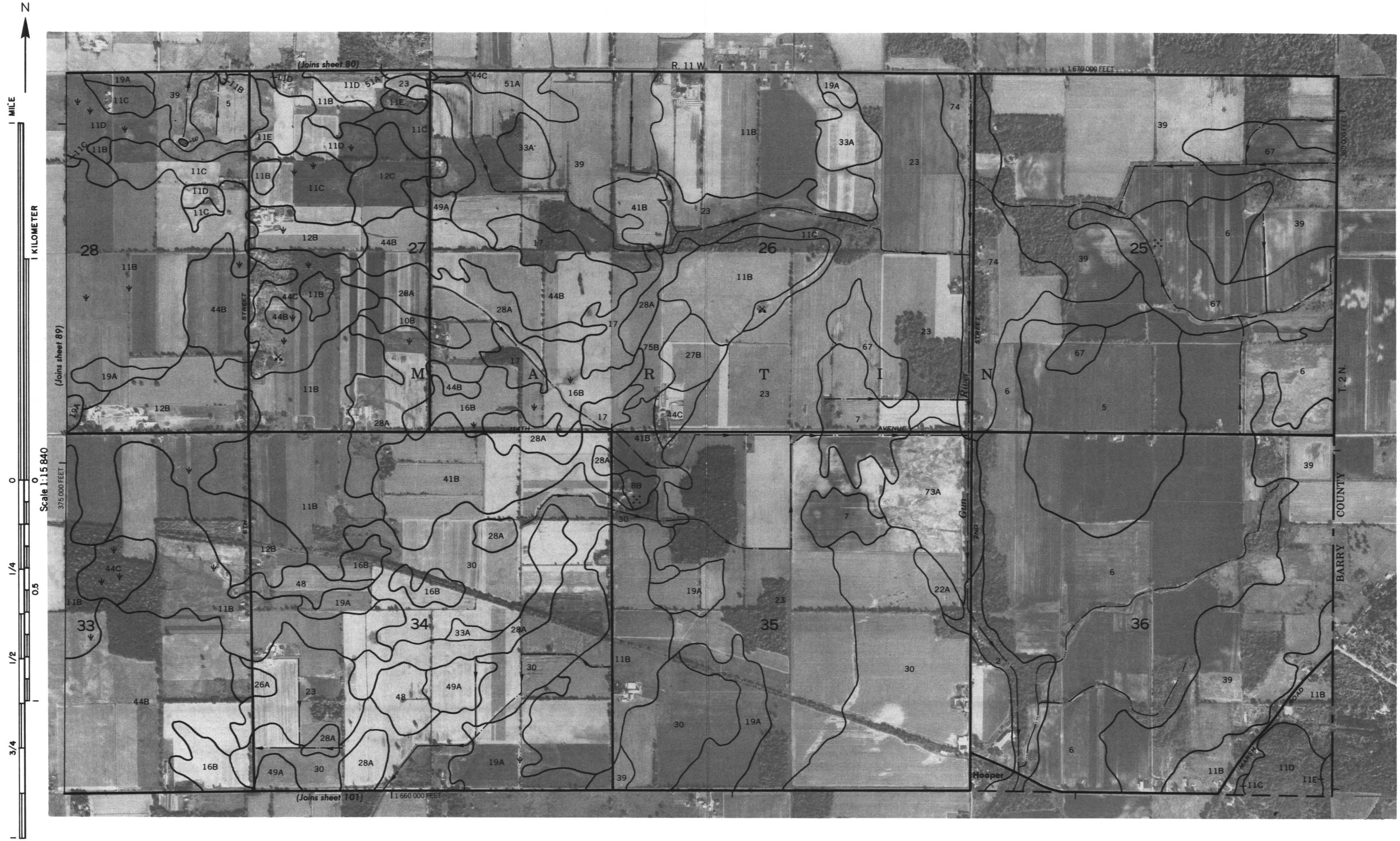
This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



ALLEGAN COUNTY, MICHIGAN NO. 9

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

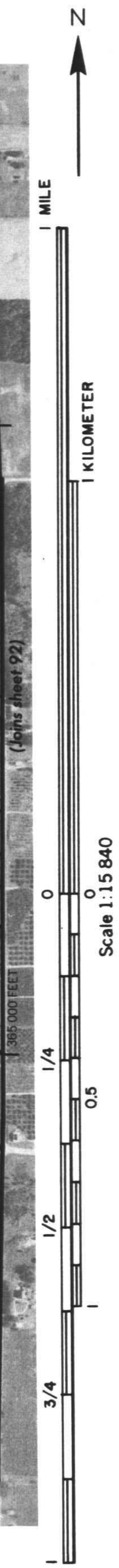
SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 90



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 91

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 92

N

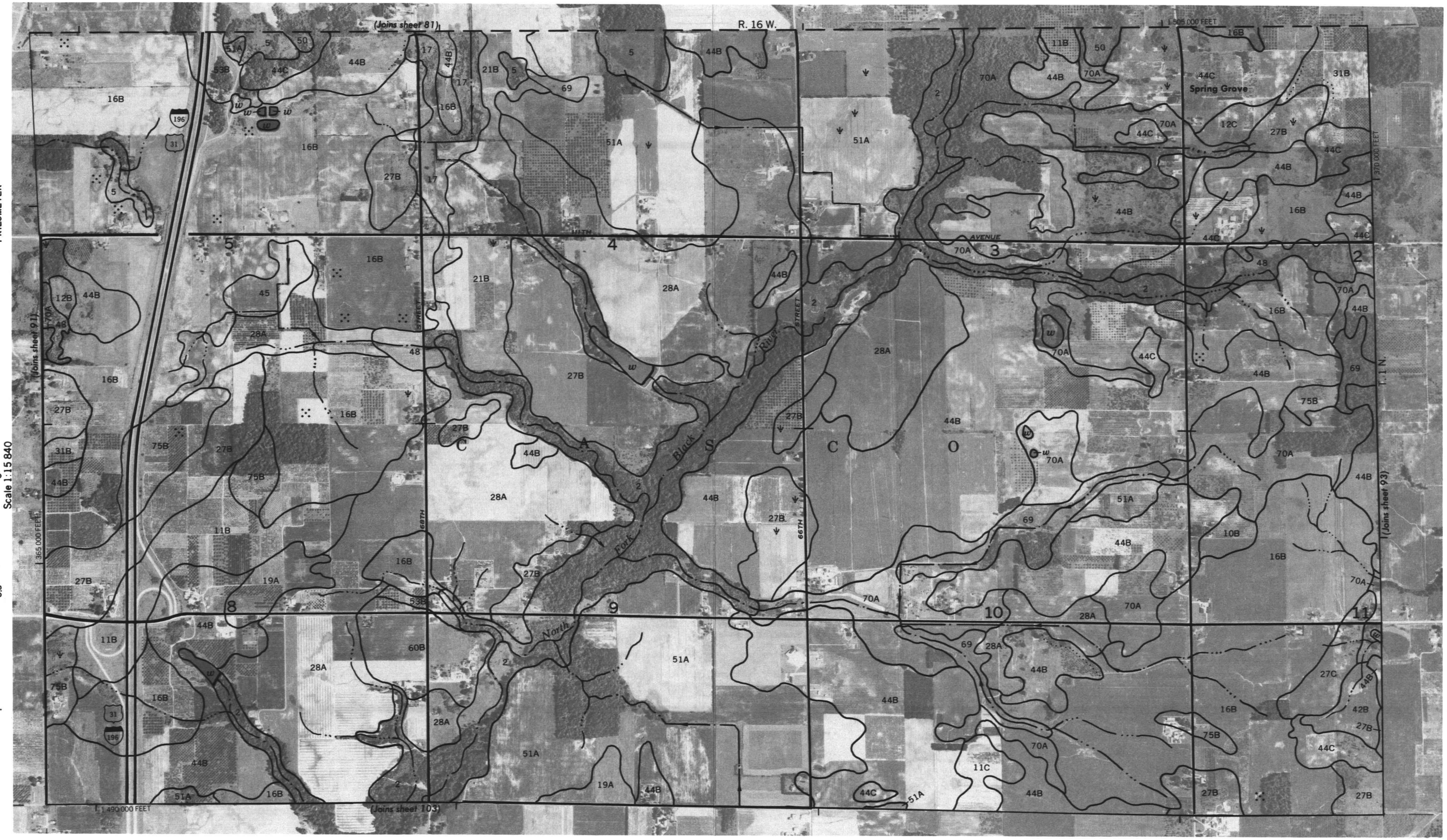
1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 1

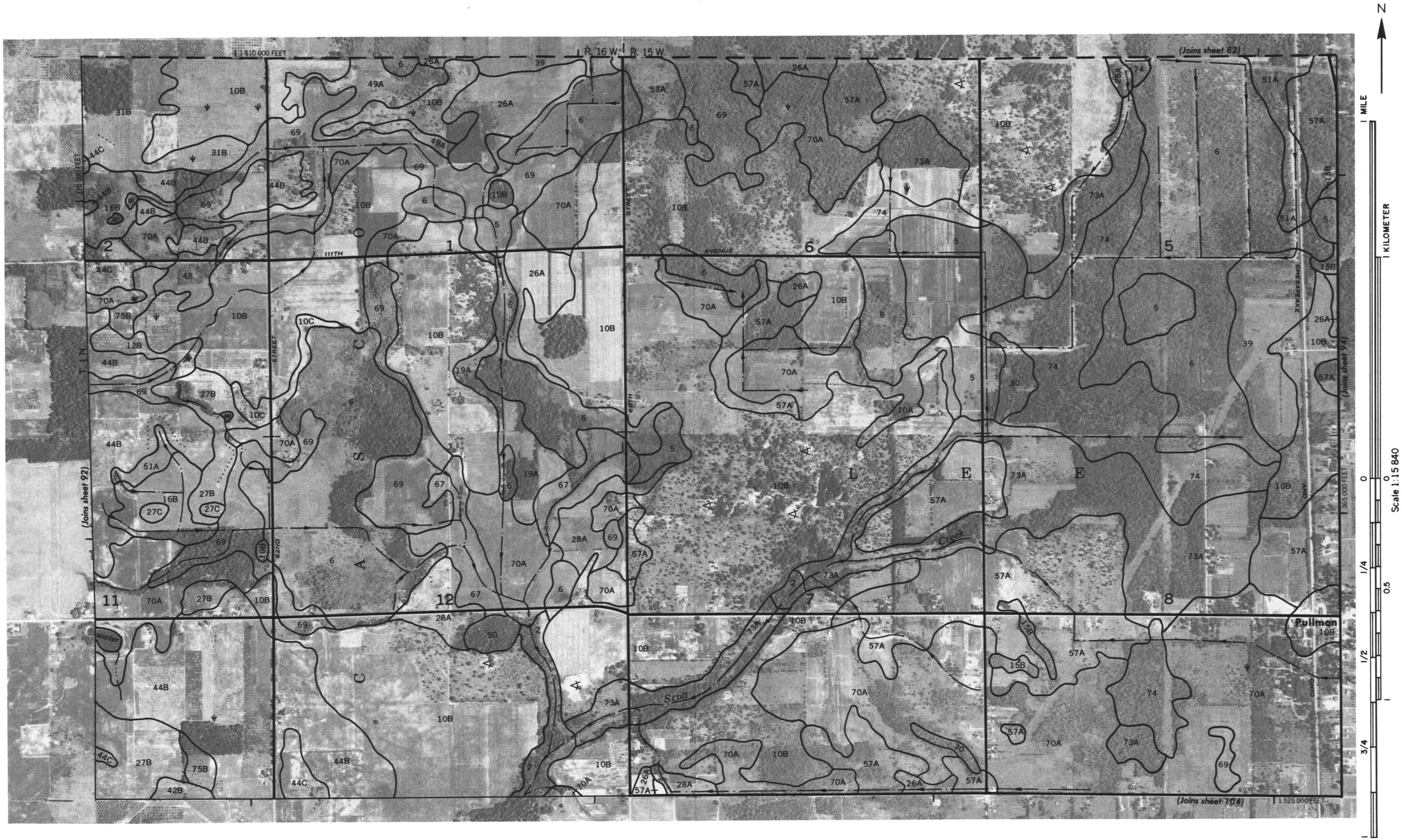
0 0.5 1



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

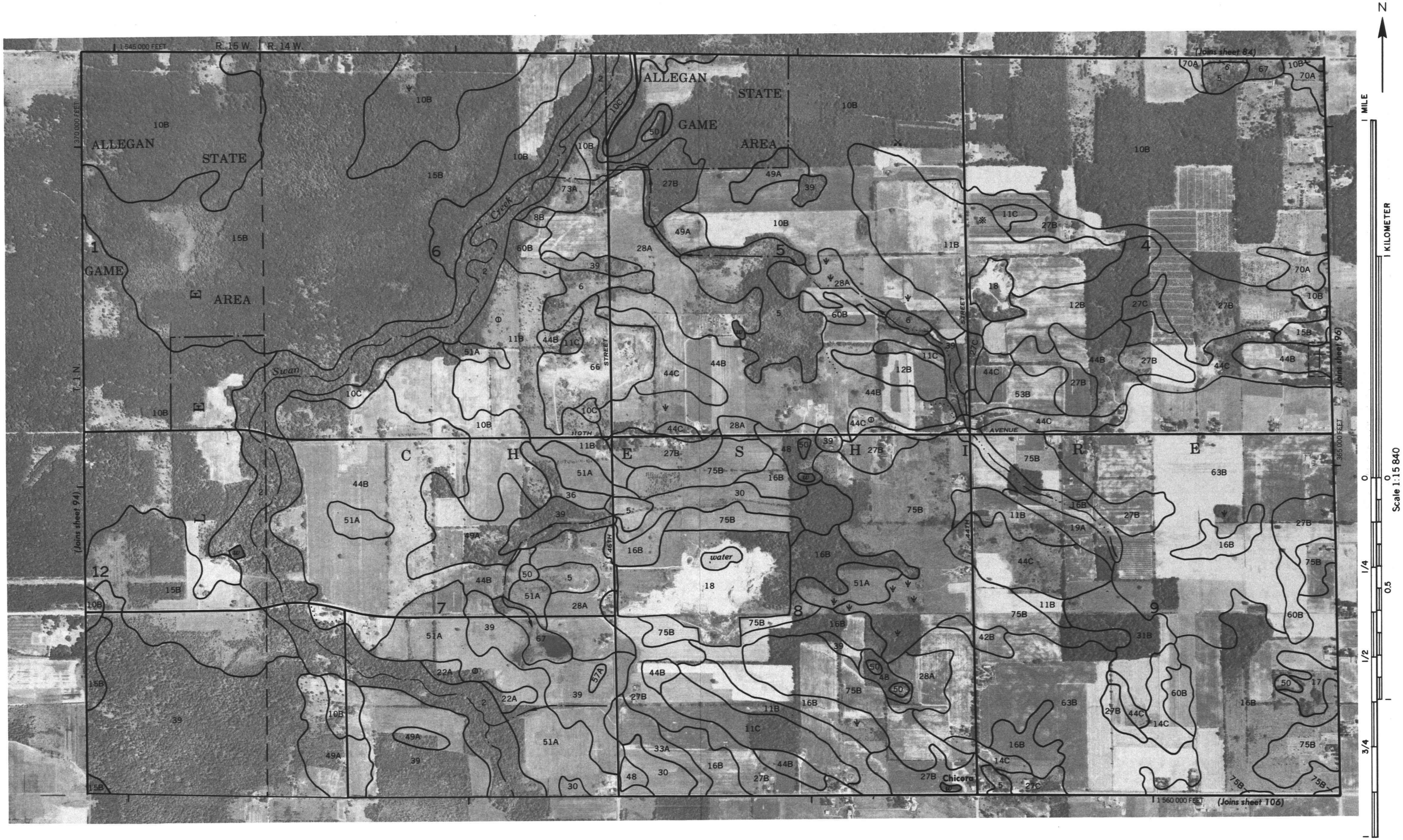
ALLEGAN COUNTY, MICHIGAN NO. 93

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 94

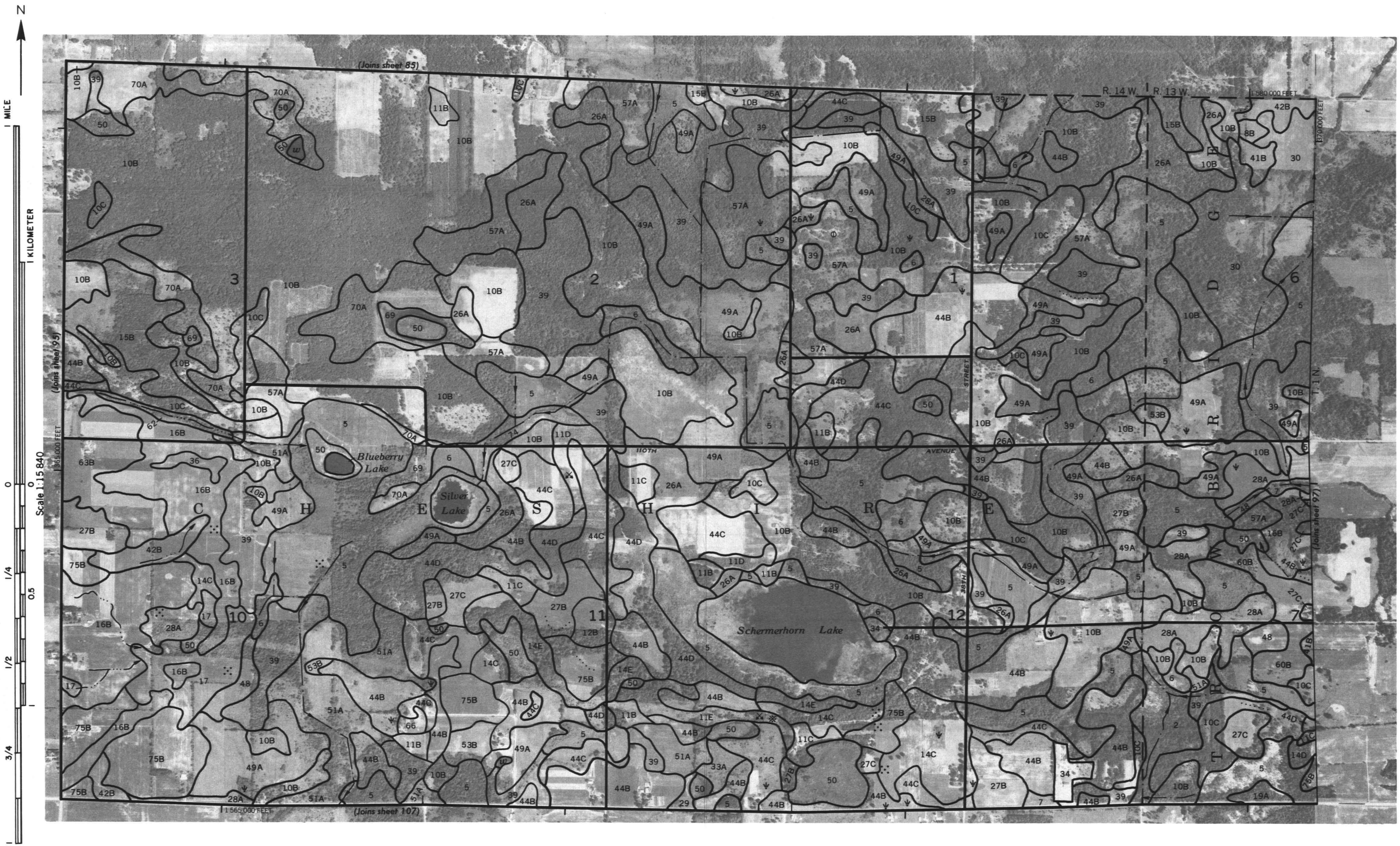
This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



ALLEGAN COUNTY, MICHIGAN NO. 95

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 96

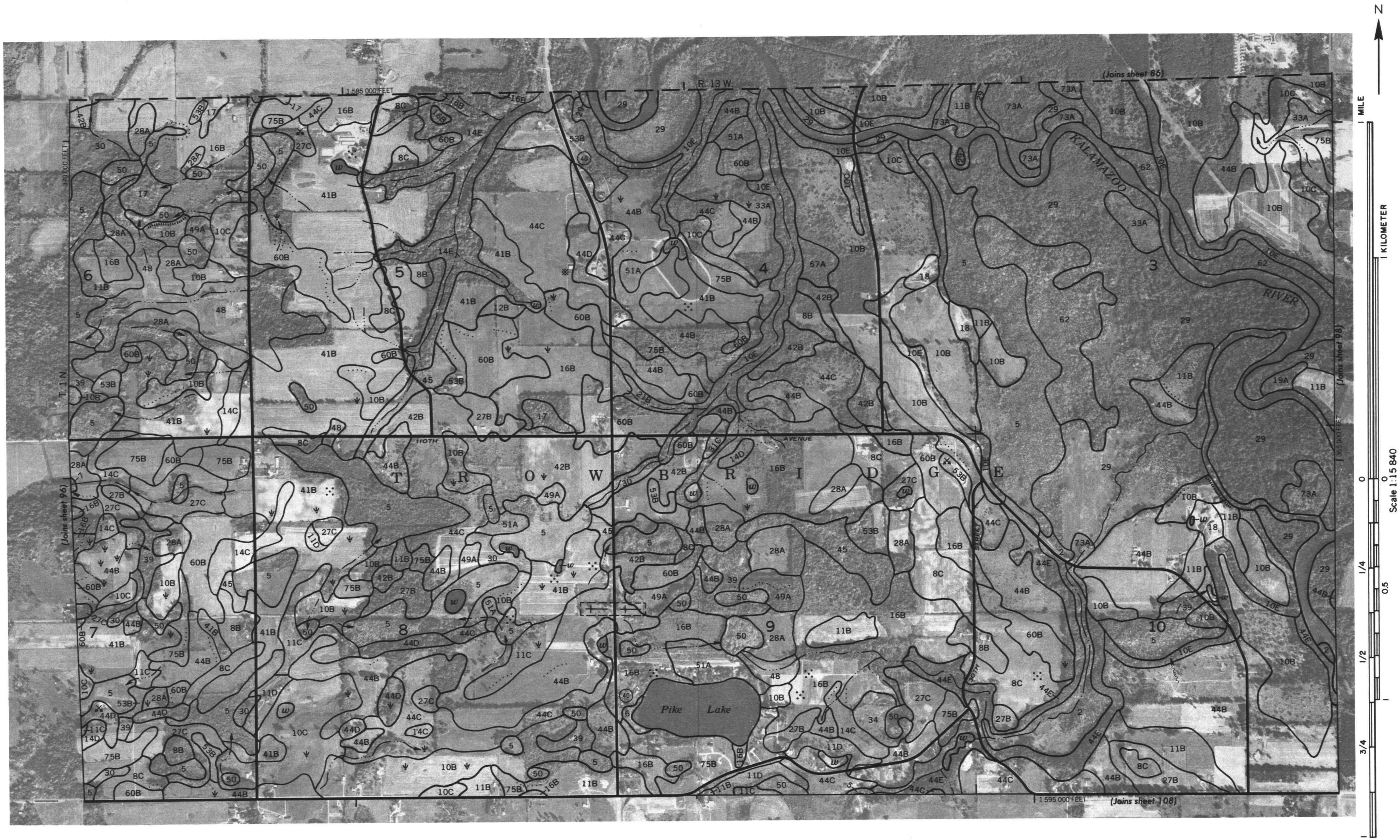


This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 96

ALLEGAN COUNTY, MICHIGAN NO. 97

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



SOIL MAP OF ALLEGAN COUNTY, MICHIGAN — SHEET NUMBER 98

N

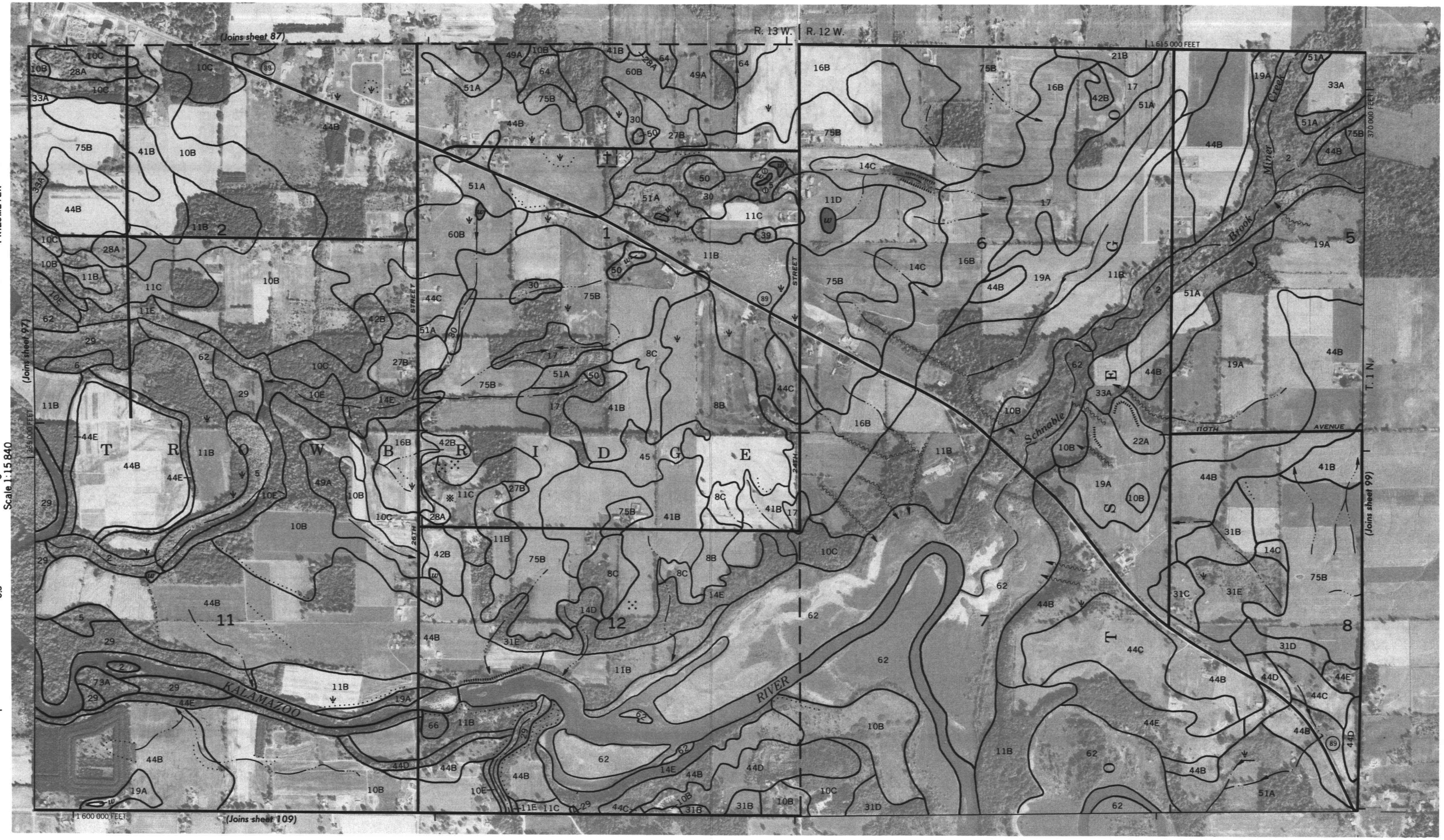
1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 1

0 0.5 1



This soil survey map is compiled on 1980 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ALLEGAN COUNTY, MICHIGAN NO. 99

This soil survey map is compiled on 1980 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.